Rai Technology University

ENGINEERING MINDS

Principles of Material Management

Subject: PRINCIPLES OF MATERIAL MANAGEMENT **Credits: 4**

SYLLABUS

Overview of Material Management

Definition of Material Management and its Scope; Relation of Supply Chain Management with Material Management; Quality Assurance; MIS in Material Management; Organization of Material Functions; Material Planning; Overview of Material Requirement Planning.

Purchasing Procedures

Purchasing Procedures; Purchase Source Selection; Price Forecasting; Purchasing of Seasonal Commodities; Purchasing under Uncertain Situations; Purchasing Capital Equipment; International Purchasing; Preparing Purchase Documents; Purchasing Ethics; Negotiations; Vendor Management; E-commerce and Purchase Management

Store Management

Definition of Store Management; Store Procedures; Incoming Material Control; Stock Accounting and Verification; Material Handling; Scrap Disposal; First in and First out; MIS Systems in Store Management; Documentation in Store Management; TQM Procedures in Store Management

Inventory Control

Importance of Inventory Control; Inventory Classification; Inventory Valuation; Working Capital Requirement and Inventory Control; Economic Order Quantity Model; Codification; Catalogue Analysis; Value Engineering; Standardization; ABC Analysis; XYZ Analysis; Case Studies of Maruti Udyog and Asian Paints

Input Systems of Inventory Management

Glossary of Material Management Terms; ABC Inventory Control; Sampling Plan; Acceptance Situations; Administered Price; Activity based Costing; Accounting Systems; Equation Cost; Acquisition Cost; Advance Payment; Airway Bill; Foreign Exchange Regulations.

Importance of Material Management

Evolution of Material Management into an Exacting Science; Knowledge Management in Material Management; Material Management and Material Science; Just In and Just Out; Import and Export Documentation in Material Management; Backward Integration and Material Management; Excise Documentation; Duty Drawbacks in Materials.

Importance of E-commerce

Definition of E-Procurement; Components of E-Procurement; Advantages of E Procurement; Improving Profits through E-Procurement; Implementation of E Procurement; Assessing an E- Procurement Package; Economics of Choosing an E Procurement Package; Expertise Needed for E-Pr Commerce

ERP and its Implementation

Definition of ERP; Importance of ERP; Globalization and ERP; Documentation and ERP; Evolution of ERP; ERP Developing as an Exacting Science; Selecting the Software; Cost of Implementation

Other Issues

Expertise to be Developed; Organizational Structure; Communication Skills; Key Result Areas; Management by Objectives; Stock out Situations; Engineering Spare Purchase; Raw Material Purchase; Recruitment and Training in the Material Management Function.

Suggested Reading:

1. Purchasing and Material Management by Nair, Publisher: Vikas Publishing House, New Delhi.
2. Handbook of Materials Management by Gopal Krishnan, P, Publisher: Prentice Hall of India Pvt. Ltd., New Delhi.
3. Materials Management: An Integrated Approach by Gopalakrishnan, P. & Sundarshan, M, Publisher: Prentice Hall of India Pvt. Ltd., New Delhi.
4. Business Logistics Management by Ronald H. Ballou, Publisher: ABC Publication

Overview of Materials Management

Structure

1.1 Overview

- 1.1.1 Management
- 1.1.2 Quality Assurance
- 1.1.3 Standards

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1.1 OVERVIEW

Material Management is a branch of logistics that deals with the tangible components of supply chain. Specifically This covers the acquisition of spare parts & replacements quality control of purchasing & ordering such parts & standards involved in ordering, shipping & warehousing.

The material management is ideal for the industries who are seeking foolproof tracking of the flow & management of material information in their enterprises from purchase, inventory management to aspects of production & sales. It can also be a stepping stone for the future ERP solutions.

In other words we can say that material management is acting as bone of the organization

On the basis of it we can measure the health of an organization now day's industries related to manufacturing, production & other verticals can use this tool to run their organization in a profitable way & to enhance their profit.

Material management can help the student to understand the importance of MM.

This course is a very useful collection of all the relevant information related to MM Which will be helpful for the student to understand this aspect in a better way?

After completion of the course shall develop the following skills & competencies:

A:-Basics of Marketing management
B:-Appropriate idea about the uses of MM in an organization
C:-Concept of MM
D:-Future of MM in organization development

Material Management

Every organization, big or small, depends on materials and services from other organizations to varying extents. These materials and services are obtained through exchange of money.

The various materials used as inputs, such as raw materials, consumables & spares, are required to be purchased & made available to the shops / users as & when needed to ensure uninterrupted production. Therefore, efficient management of input materials is of paramount importance in a business organization for maximizing materials productivity, which ultimately adds to the profitability of the organization.

The main concern of any Business management is to maximize the Return on Investment (ROI). The relationship of various entities here can be expressed as:

$$ROI = \frac{Profit}{Sales} \times \frac{Sales}{Current\ Asset + Fixed\ Asset}$$

Thus ROI = profit margin + asset turnover rate

A firm's profit margin reflects management's ability to control costs in relations to revenue. The asset turnover rate reflects management's ability to effectively utilize the firm's productive assets. Hence a firm can improve ROI in three ways:-

- By reducing cost
- By getting more sales from available assets or Get Currency converter
- By some combination of the above
  Thus, it is the cost control that holds the key.

In many manufacturing organizations, the cost of materials alone happens to range from 40 % to 60 % of the total expenditure. Obviously, a better management of material is expected to ensure reduction in overall cost of operation and smoothness in supply of inputs.

This requires well coordinated approach towards various issues involving decision making with respect to materials.

All the materials related activities such as material planning & indenting, procedure, variety reduction through standardization & rationalization, reducing uncertainties in demand & supply, handling & transportation, inspection, proper storage & issue of materials to the internal customers, inventory management, vendor management & finally disposal of obsolete, surplus & scrap materials etc. taken together is termed as "INTEGRATED MATERIAL MANAGEMENT".

To carry out these functions efficiently, it is essential to have a very good supplier base, order booking process & inventory management system as well as expert MATERIALS MANAGEMENT (MM) professional.

Materials management is just managing all types of materials in an organization. It can be broken down into three areas: acquisition, quality control, and standards.

1.1.2 Quality Assurance

Materials management also ensures that parts and materials used in the supply chain meet minimum requirements by performing Quality Assurance (QA). While most of the writing and discussion about materials management is on acquisition and standards, much of the day to day work conducted in materials management deals with QA issues. Parts and material are tested, both before purchase orders are placed and during use, to ensure there are no short or long term issues that would disrupt the supply chain. Material management is most important for industrial point of view

Quality assurance, or QA for short, refers to planned and systematic production processes that provide confidence in a product's suitability for its intended purpose. It is a set of activities intended to ensure that products (goods and/or services) satisfy customer requirements in a systematic, reliable fashion. QA cannot absolutely guarantee the production of quality products, unfortunately, but makes this more likely.

Two key principles characterize QA: "fit for purpose" (the product should be suitable for the intended purpose) and "right first time" (mistakes should be eliminated). QA includes regulation of the quality

of raw materials, assemblies, products and components; services related to production; and management, production and inspection processes.

It is important to realize also that quality is determined by the intended users, clients or customers, not by society in general: it is not the same as 'expensive' or 'high quality'. Even lowly bottom-of-the-range goods can be considered quality items if they meet a market need.

1.1.3 Standards

The final component of materials management is standards compliance. There are standards that are followed in supply chain management that are critical to a supply chain's function. For example, a supply chain that uses Just In Time or lean replenishment requires absolute perfection in the shipping of parts and material from purchasing agent to warehouse to place of destination. Systems reliant on vendor-managed inventories must have up-to-date computerized inventories and robust ordering systems for outlying vendors to place orders on. Materials management typically insures that the warehousing and shipping of such components as are needed follows the standards required to avoid problems. This component of materials management is the fastest changing part, due to recent innovations in SCM and in logistics in general, including outsourced management of warehousing, Mobile computing and real-time logistical inventories

Materials management, thus, can be defined as a joint action of various materials activities directed towards a common goal and that is to achieve an integrated management approach to planning, acquiring processing and distributing production materials from the raw material state to the finished product state.

Materials Management as such is a key business function that is responsible for co-ordination of planning, sourcing, purchasing moving, storing and controlling materials in an optimum manner so as to provide a pre-decided service to the customer at a minimum cost.

Materials Management's scope is vast. Its sub functions include Materials planning and control, Purchasing, Stores and Inventory Management besides others.

In its process of managing, materials management has such sub fields as inventory management, value analysis, receiving, stores and management of obsolete, slow moving and non moving. The various activities represent these four functions:-

Planning and control

Purchasing

Value analysis and

Physical distribution

1.2 ROLE OF MATERIAL MANAGEMENT

The fundamental objectives of the Materials Management function are acquisition of materials and services, often called the famous 5 Rs of Materials Management:

- of the right quality
- in the right quantity
- at the right time
- from the right source
- at the right time

From the management point of view, the key objectives of MM are:

1. To buy at the lowest price , consistent with desired quality and service
2. To maintain a high inventory turnover , by reducing excess storage , carrying costs and inventory losses occurring due to deteriorations , obsolescence and pilferage
3. To maintain continuity of supply , preventing interruption of the flow of materials and services to users
4. To maintain the specified material quality level and a consistency of quality which permits efficient and effective operation
5. To develop reliable alternate sources of supply to promote a competitive atmosphere in performance and pricing
6. To minimize the overall cost of acquisition by improving the efficiency of operations and procedures
7. To hire, develop, motivate and train personnel and to provide a reservoir of talent
8. To develop and maintain good supplier relationships in order to create a supplier attitude and desire furnish the organisation with new ideas , products, and better prices and service
9. To achieve a high degree of cooperation and coordination with user departments
10. To maintain good records and controls that provide an audit trail and ensure efficiency and honesty
11. To participate in Make or Buy decisions

1.2.1 Definition & Scope of Materials Management

Materials Management thus can be defined as that function of business that is responsible for the Coordination of planning, sourcing, purchasing, moving, storing and controlling materials in an optimum manner so as to provide service to the customer, at a pre-decided level at a minimum cost.

The broad Materials function has the following as identified and interlinked sub functions:

Materials planning and control: Materials required for any operation are based on the sales forecasts and production plans. Planning and control is done for the materials taking into account the materials not available for the operation and those in hand or in pipe line. This involves estimating the individual

requirements of parts, preparing materials budget, forecasting the levels of inventories, scheduling the orders and monitoring the performance in relation to production and sales.

Purchasing: Basically, the job of a materials manager is to provide, to the user departments right material at the right time in right quantity of right quality at right price from the right source.

To meet these objectives the activities undertaken include selection of sources of supply, finalization of terms of purchase, placement of purchase orders, follow up, maintenance of relations with vendors, approval of payments to vendors, evaluating, rating and developing vendors.

Stores: Once the material is delivered, its physical control, preservation, minimization of obsolescence and damage through timely disposal and efficient handling, maintenance of records, proper locations and stocking is done in Stores.

80:20An illustration of a company's supply chain; the arrows stand for supplier-relationship management, internal SCM and customer-relationship management.

1.2.2 Supply chain modeling

There are a variety of supply chain models, which address both the upstream and downstream sides.

The SCOR (Supply Chain Operations Reference) model, developed by the Supply Chain Council, measures total supply chain performance. It is a process reference model for supply-chain management, spanning from the supplier's supplier to the customer's customer It includes delivery and order fulfillment performance, production flexibility, warranty and returns processing costs, inventory and asset turns, and other factors in evaluating the overall effective performance of a supply chain.

1.2.3 Supply chain management

In the 1980s the term Supply Chain Management (SCM) was developed to express the need to integrate the key business processes, from end user through original suppliers. Original suppliers being those that provide products, services and information that add value for customers and other stakeholders. The basic idea behind the SCM is that companies and corporations involve themselves in a supply chain by exchanging information regarding market fluctuations, production capabilities.

If all relevant information is accessible to any relevant company, every company in the supply chain has the possibility to and can seek to help optimizing the entire supply chain rather than sub optimize based on a local interest. This will lead to better planned overall production and distribution which can cut costs and give a more attractive final product leading to better sales and better overall results for the companies involved.

Incorporating SCM successfully leads to a new kind of competition on the global market where competition is no longer of the company versus company form but rather takes on a supply chain versus supply chain form.

The primary objective of supply chain management is to fulfill customer demands through the most efficient use of resources, including distribution capacity, inventory and labor. In theory, a supply

chain seeks to match demand with supply and do so with the minimal inventory. Various aspects of optimizing the supply chain include liaising with suppliers to eliminate bottlenecks; sourcing strategically to strike a balance between lowest material cost and transportation, implementing JIT (Just In Time) techniques to optimize manufacturing flow; maintaining the right mix and location of factories and warehouses to serve customer markets, and using location/allocation, vehicle routing analysis, Dynamic programming and, of course, traditional logical optimization to maximize the efficiency of the distribution side.

There is often confusion over the terms supply chain and logistics. It is now generally accepted that the term Logistics applies to activities within one company/organization involving distribution of product whereas the term Supply chain also encompasses manufacturing and procurement and therefore has a much broader focus as it involves multiple enterprises, including suppliers, manufacturers and retailers, working together to meet a customer need for a product or service.

1.2.4 Integrated Materials Management

Various functions served by materials management include the material planning, purchasing, receiving, stores, inventory control, scrap and surplus disposal. All these functions can have separate working norms including the one for performance.

Efficient management of input materials is of utmost importance in a business organization for maximizing materials productivity, which ultimately adds to the profitability of the organization.

This requires well coordinated approach towards various issues involving decision making with respect to materials.

All the materials related activities such as material planning & indenting, purchase systems & procedure, variety reduction through standardization & rationalization, reducing uncertainties in demand & supply, handling & transportation, inspection, proper storage & issue of materials to the internal customers, inventory management, vendor management & finally disposal of obsolete, surplus & scrap materials etc. taken together is termed as Integrated Materials Management

While inventory manager would like to have minimum level of inventory to show of his performance, purchasing manager would like to place bulk orders in order to lessen his work load and show discounts as reductions. Both of these acts may be little contradictory from the organizational point of view. That is if some of the functions were to be handled separately, a conflict of interests may occur.

Therefore, the conflicting objectives need to be balanced and intertwined from a total organizational viewpoint so as to achieve optimum results for the organization as a whole.

In an integrated set up, one materials manager (usually the chief) is responsible for all suchinter related functions and he is in a position to exercise control and coordinate all the activities with a view to ensure proper balance of the conflicting objectives of the individual functions.

Integration also attains the synergetic advantage in terms of eliminating water tight compartments that set in a disjointed environment of working. The resulting benefits can be seen in terms of rapid transfer of data, through effective and informal communication channels.

This is crucial as the materials management function involves handling vast amount of data. Therefore, integrating the various functions identify themselves to a common materials management department which in turn results in greater coordination and better control.

Now days, in many traditions bound companies too, even the spare part planning which hitherto was done by the operation people has been brought under the umbrella of an Integrated materials Management.

Better accountability ,better coordination, better performance, better adaptability to EDP are some of the tangible advantages of the Integrated Materials Management besides a perceptible team spirit , morale and cooperation are the intangible gains.

Training and development of staff and executive through rotation of people is another great advantage because of a bigger canvas produced by integration of Materials function. To carry out these functions efficiently, it is essential to have a very good supplier base, order booking process & inventory management system as well as expert Materials Management (MM) professionals.

1.3 MEANING OF QUALITY ASSURANCE STANDARDS OF MATERIAL MANAGEMENT

Quality assurance, or QA for short, refers to planned and systematic production processes that provide confidence in a product's suitability for its intended purpose. It is a set of activities intended to ensure that products (goods and/or services) satisfy customer requirements in a systematic, reliable fashion. QA cannot absolutely guarantee the production of quality products, unfortunately, but makes this more likely.

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It is important to realize also that quality is determined by the intended users, clients or customers, not by society in general: it is not the same as 'expensive' or 'high quality'. Even lowly bottom-of-the-range goods can be considered quality items if they meet a market need.

1.3.1 Quality assurance versus quality control

Whereas quality control emphasizes testing and blocking the release of defective products, quality assurance is about improving and stabilizing production and associated processes to avoid or at least minimize issues that led to the defects in the first place. However, QA does not necessarily eliminate the need for QC: some product parameters are so critical that testing is still necessary just in case QA fails.

1.3.2 Failure testing

A valuable process to perform on a whole consumer product is failure testing , the operation of a product until it fails, often under stresses such as increasing vibration , temperature and humidity . This exposes many unanticipated weaknesses in a product, and the data is used to drive engineering and manufacturing process improvement Often quite simple changes can dramatically improve product service, such as changing to mould-resistant paint or adding lock-washer placement to the training for new assembly personnel.

1.3.3 Statistical control

Many organizations use statically process control to bring the organization to SIX Sigma levels of quality, in other words, so that the likelihood of an unexpected failure is confined to six standard deviation on the normal distribution. This probability is less than one-millions . Items controlled often include clerical tasks such as order-entry as well as conventional manufacturing tasks.

Traditional statistical process controls in manufacturing operations usually proceed by randomly sampling and testing a fraction of the output. Variances in critical tolerances are continuously tracked and where necessary corrected before bad parts are produced

1.3.4 Total quality control

Deep analysis of QA practices and premises used about them is the most necessary inspection control of all in cases where, despite statistical quality control techniques or quality improvements implemented, sales decrease.

The major problem which leads to a decrease in Sales was that the specification did not include the most important factor, “What the specifications have to state in order to satisfy the customer requirements?”.

The major characteristics, ignored during the search to improve manufacture and overall business performance were:

- Reliability
- Maintainability
- Safety
- Strength

As the most important factor had been ignored, a few refinements had to be introduced:

1. Marketing had to carry out their work properly and define the customer’s specifications.
2. Specifications had to be defined to conform to these requirements
3. Conformance to specifications i.e. drawings , standards and other relevant documents, were introduced during manufacturing, planning and control.
4. Management had to confirm all operators are equal to the work imposed on them and holidays, celebrations and disputes did not affect any of the quality levels.

5. Inspections and tests were carried out, and all components and materials bought in or otherwise, conformed to the specifications, and the measuring equipments was accurate , this is the responsibility of the QA/QC department.
6. Any complaints received from the customers were satisfactorily dealt with in a timely manner.
7. Feedback from the user/customer is used to review designs.
8. Consistent data recording and assessment and documentation integrity.
9. Product and/or process change management and notification.

1.3.5 Standards

The final component of materials management is standards compliance. There are standards that are followed in supply chain management that are critical to a supply chain's function. For example, a supply chain that uses just-in time or lean replenishment requires absolute perfection in the shipping of parts and material from purchasing agent to warehouse to place of destination. Systems reliant on vendor-managed inventories must have up-to-date computerized inventories and robust ordering systems for outlying vendors to place orders on. Materials management typically insures that the warehousing and shipping of such components as are needed follows the standards required to avoid problems. This component of materials management is the fastest changing part, due to recent innovations in SCM_and in logistics in general, including outsourced management of ware housing, mobile computing, and real-time logistical inventories

1.4 CORPORATE POLICY OF MM/JIT/KANBAN

Just-in-time (JIT) is an inventory strategy implemented to improve the return on investment of a business by reducing in-process inventory and its associated costs In order to achieve JIT the process must have signals of what is going on elsewhere within the process. This means that the process is often driven by a series of signals, which can be kanban *Kanban*), that tell production processes when to make the next part. Kanban are usually 'tickets' but can be simple visual signals, such as the presence or absence of a part on a shelf. When implemented correctly, JIT can lead to dramatic improvements in a manufacturing organization's return on investment quality, and efficiency. Some have suggested that "Just on Time" would be a more appropriate name since it emphasizes that production should create items that arrive when needed and neither earlier nor later.

1.4.1 Integrated Materials Management

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For example, while inventory manager would like to have minimum level of inventory to show of his performance, purchasing manager would like to place bulk orders in order to lessen his work load and show discounts as reductions. Both of these acts may be little contradictory from the organizational point of view. That is if some of the functions were to be handled separately, a conflict of interests may occur.

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Quick communication of the consumption of old stock which triggers new stock to be ordered is key to JIT and inventory reduction. This saves warehouse space and costs. However since stock levels are determined by historical demand , any sudden demand rises above the historical average demand, the firm will deplete inventory faster than usual and cause customer service issues. Some have suggested that recycling Kanban faster can also help flex the system by as much as 10-30%. In recent years manufacturers have touted a trailing 13 week average as a better predictor for JIT planning than most forecasters could provide.

The technique was first used by the Ford Motor Company as described explicitly by Henry Ford 's *My Life and Work* (1923): "We have found in buying materials that it is not worthwhile to buy for other than immediate needs. We buy only enough to fit into the plan of production, taking into consideration the state of transportation at the time. If transportation were perfect and an even flow of materials could be assured, it would not be necessary to carry any stock whatsoever. The carloads of raw materials would arrive on schedule and in the planned order and amounts, and go from the railway cars into production. That would save a great deal of money, for it would give a very rapid turnover and thus decrease the amount of money tied up in materials. With bad transportation one has to carry larger stocks." This statement also describes the concept of "dock to factory floor" in which incoming materials are not even stored or warehoused before going into production. The concept needed an effective freight management system (FMS); Ford's *Today and Tomorrow* (1926) describes one.

The technique was subsequently adopted and publicized by Toyota Motor Corporation of Japan as part of its Toyota production System (TPS). However, Toyota famously did not adopt the procedure from Ford, but from Piggly Wiggly .Although Toyota visited Ford as part of its tour of American businesses, Ford had not fully adopted the Just-In-Time system, and Toyota executives were appalled at the piles of inventory laying around and the uneven work schedule of the employees of Ford. Toyota also visited Piggly Wiggly, and it was there that Toyota executives first observed a fully functioning and successful Just-In-Time system, and modeled TPS after it.

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also visited Piggly Wiggly, and it was there that Toyota executives first observed a fully functioning and successful Just-In-Time system, and modeled TPS after it.

Philosophy

The philosophy of JIT is simple - inventory is defined to be waste. JIT inventory systems expose the hidden causes of inventory keeping and are therefore not a simple solution a company can adopt; there is a whole new way of working the company must follow in order to manage its consequences. The ideas in this way of working come from many different disciplines including statistics, industrial engineering, production management and behavioral science. In the JIT inventory philosophy there are views with respect to how inventory is looked upon, what it says about the management within the company, and the main principle behind JIT.

Inventory is seen as incurring costs, or waste, instead of adding and storing value, contrary to traditional accounting. This does not mean to say JIT is implemented without an awareness that removing inventory exposes pre-existing manufacturing issues. With this way of working, businesses are encouraged to eliminate inventory that does not compensate for manufacturing process issues, and then to constantly improve those processes so that less inventory can be kept. Secondly, allowing any stock habituates the management to stock keeping and it can then be a bit like a narcotic. Management are then tempted to keep stock there to hide problems within the production system. These problems include backups at work centers, machine reliability, and process variability, lack of flexibility of employees and equipment, and inadequate capacity among other things.

In short, the just-in-time inventory system is all about having “the right material, at the right time, at the right place, and in the exact amount”, without the safety net of inventory. The JIT system has implications of which are broad for the implementers.

Stocks

JIT emphasis’s inventory as one of the seven wastes (Production, waiting time, transportation, inventory, processing, motion and product defect), and as such its practice involves the philosophical aim of reducing input buffer inventory to zero. Zero buffer inventories means that production is not protected from exogenous (external) shocks. As a result, exogenous shocks reducing the supply of input can easily slow or stop production with significant negative consequences. For example, Toyota suffered a major supplier failure as a result of the 1997 Aisin fire which rendered one of its suppliers incapable of fulfilling Toyota’s orders. In the U.S., the 1992 railway strikes resulted in General Motors having to idle a 75,000-worker plant because they had no supplies coming in.

Transaction cost approach

JIT reduces inventory in a firm. However, unless it is used throughout the supply chain, it can be hypothesized that firms are simply outsourcing their input inventory to suppliers (Naj 1993). This effect was investigated by Newman (1993), who found, on average, suppliers in Japan charged JIT customers a 5% price premium.

Environmental concerns

During the birth of JIT, multiple daily deliveries were often made by bicycle; with increases in scale has come the adoption of vans and lorries (trucks) for these deliveries. Cushman (1994) has highlighted the potential and actual problems this causes with regard to gridlock and the burning fossil fuels . This violates three JIT wastes:

1. Time; wasted in traffic jams
2. Inventory; specifically pipeline (in transport) inventory and
3. Scrap; with respect to petrol or diesel burned while not physically moving.

Price volatility

JIT implicitly assumes a level of input price stability such that it is desirable to inventory inputs at today's prices. Where input prices are expected to rise storing inputs may be desirable.

Quality volatility

JIT implicitly assumes the quality of available inputs remains constant over time. If not, firms may benefit from hoarding high quality inputs.

Demand stability

Carmaker (1989) highlights the importance of relatively stable demand which can help ensure efficient capital utilization rates. Carmaker argues without a significant stable component of demand, JIT becomes untenable in high capital cost production. In the U.S., the 1992 railway strikes resulted in General Motors having to idle a 75,000-worker plant because they had no supplies coming in.

Benefits

As most companies use an inventory system best suited for their company, the Just-In-Time Inventory System (JIT) can have many benefits resulting from it. The main benefits of JIT are listed below.

1. *Set up times are significantly reduced in the factory.* Cutting down the set up time to be more productive will allow the company to improve their bottom line to look more efficient and focus time spent on other areas that may need improvement. This allows the reduction or elimination of the inventory held to cover the "changeover" time, the tool used here is SMED
2. *The flows of goods from warehouse to shelves are improved.* Having employees focused on specific areas of the system will allow them to process goods faster instead of having them vulnerable to fatigue from doing too many jobs at once and simplifies the tasks at hand. Small or individual piece lot sizes reduce lot delay inventories which simplifies inventory flow and its management.
3. *Employees who possess multiple skills are utilized more efficiently.* Having employees trained to work on different parts of the inventory cycle system will allow companies to use workers in situations where they are needed when there is a shortage of workers and a high demand for a particular product.

4. *Better consistency of scheduling and consistency of employee work hours.* If there is no demand for a product at the time, workers don't have to be working. This can save the company money by not having to pay workers for a job not completed or could have them focus on other jobs around the warehouse that would not necessarily be done on a normal day.
5. *Increased emphasis on supplier relationships.* No company wants a break in their inventory system that would create a shortage of supplies while not having inventory sit on shelves. Having a trusting supplier relationship means that you can rely on goods being there when you need them in order to satisfy the company and keep the company name in good standing with the public.
6. *Supplies continue around the clock keeping workers productive and businesses focused on turnover.* Having management focused on meeting deadlines will make employees work hard to meet the company goals to see benefits in terms of job satisfaction, promotion or even higher pay.

Problems

Within a JIT system

The major problem with just-in-time operation is that it leaves the supplier and downstream consumers open to Supply Socks and large supply or demand changes. For internal reasons, this was seen as a feature rather than a bug by Ohno used the analogy of lowering the level of water in a river in order to expose the rocks to explain how removing inventory showed where flow of production was interrupted. Once the barriers were exposed, they could be removed; since one of the main barriers was rework, lowering inventory forced each shop to improve its own quality or cause a holdup in the next downstream area. One of the other key tools to manage this weakness is Production Leveling to remove these variations. Just-in-time is a means to improving performance of the system, not an end.

With very low stock levels meaning that there are shipments of the same part coming in sometimes several times per day, Toyota is especially susceptible to an interruption in the flow. For that reason, Toyota is careful to use two suppliers for most assemblies. As noted in Liker (2003), there was an exception to this rule that put the entire company at risk by the 1997 Aisin Fire However, since Toyota also makes a point of maintaining high quality relations with its entire supplier network, several other suppliers immediately took up production of the Aisin-built parts by using existing capability and documentation. Thus, a strong, long-term relationship with a few suppliers is preferred to short-term, price-based relationships with competing suppliers. This long-term relationship has also been used by Toyota to send Toyota staff into their suppliers to improve their suppliers' processes. These interventions have now been going on for twenty years and result in improved margins for Toyota and the supplier as well as lower final customer costs and a more reliable supply chain. Toyota encourages their suppliers to duplicate this work with their own suppliers.

1.4.3 KANBAN

Kanban where kan*,* means "visual," and *ban,* means "card" or "board") is a concept related to lean and Just In Time (JIT) production. The Japanese word *kanban* (pronounced Kanban) is a common everyday term meaning "signboard" or "billboard" and utterly lacks the specialized meaning that this

loanword has acquired in English. According to Taiichi ONO , the man credited with developing JIT, kanban is a means through which JIT is achieved.

Kanban is a signaling system to trigger action. As its name suggests, kanban historically uses cards to signal the need for an item. However, other devices such as plastic markers (kanban squares) or balls (often golf balls) or an empty part-transport trolley or floor location can also be used to trigger the movement, production, or supply of a unit in a factory

It was out of a need to maintain the level of improvements that the kanban system was devised by Toyota . Kanban became an effective tool to support the running of the production system as a whole. In addition, it proved to be an excellent way for promoting improvement.

Origins

The term *kanban* describes an embellished wooden or metal sign which has often been reduced to become a trade mark or seal. Since the 17th century, this expression in the Japanese mercantile system has been as important to the merchants of Japan as military banners have been to the samurai. Visual puns, calligraphy and ingenious shapes — or kanban — define the trade and class of a business or tradesman. Often produced within rigid confusion restrictions on size and color, the signs and seals are mast MR Pieces of logo and symbol design. For example, sumo wrestler, a symbol of strength, may be used as kanban on a pharmacy's sign to advertise a treatment for anemia.

Operation

An important determinant of the success of "push" production scheduling is the quality of the demand forecast which provides the "push". Kanban, by contrast, is part of a pull system that determines the supply, or production, according to the actual demand of the customers. In contexts where supply time is lengthy and demand is difficult to forecast, the best one can do is to respond quickly to observed demand. This is exactly what a kanban system can help: it is used as a demand signal which immediately propagates through the supply chain. This can be used to ensure that intermediate stocks held in the supply chain are better managed, usually smaller. Where the supply response cannot be quick enough to meet actual demand fluctuations, causing significant lost sales, then stock building may be deemed as appropriate which can be achieved by issuing more kanban. Taiichi Ohno states that in order to be effective kanban must follow strict rules of use (Toyota, for example, has six simple rules) and that close monitoring of these rules is a never-ending problem to ensure that kanban does what is required.

A simple example of the kanban system implementation might be a "three-bin system" for the supplied parts (where there is no in-house manufacturing) — one bin on the factory floor, one bin in the factory store and one bin at the suppliers' store. The bins usually have a removable card that contains the product details and other relevant information — the kanban card. When the bin on the factory floor is empty, the bin and kanban card are returned to the factory store. The factory store then replaces the bin on the factory floor with a full bin, which also contains a kanban card. The factory store then contacts the supplier's store and returns the now empty bin with its kanban card. The supplier's inbound product bin with its kanban card is then delivered into the factory store completing the final step to the system. Thus the process will never run out of product and could be described as a loop, providing the

exact amount required, with only one spare so there will never be an issue of over-supply. This 'spare' bin allows for the uncertainty in supply, use and transport that are inherent in the system. The secret to a good kanban system is to calculate how many kanban cards are required for each product. Most factories using kanban use the colored board system (Hiejunka Box)This consists of a board created especially for holding the kanban cards.

1.4.4 E-Kanban Systems

Many manufacturers have implemented electronic kanban systems Electronic kanban systems, or E-Kanban systems, help to eliminate common problems such as manual entry errors and lost cards. E-Kanban systems can be integrated into Enterprise Resource Planning (ERP) systems. Integrating E-Kanban systems into ERP systems allows for real-time demand signaling across the supply chain and improved visibility. Data pulled from E-Kanban systems can be used to optimize inventory levels by better tracking supplier lead and replenishment times.

1.5 ORGANIZATION OF MATERIALS MANAGEMENT FUNCTIONS

The overall objectives of an organization tend to be achieved most efficiently when the organization is structured by grouping similar activities together. The process begins by dividing the total operation into its basic functional components. Each component, in turn, is divided into a number of sub-functions. The process is continued until each individual job encompasses a reasonable number of related tasks. The basic aim is to have a system that is functionalized, has proper control over the activities and is well co-ordinate.

Materials Management provides an integrated systems approach to the co-ordination of the materials activities and the control of total material costs. Obviously, the MM organization is

Derived from its fundamental objectives. Since Materials management function ranges from receiving the material requisition to placement of purchase orders and then on the other hand to receiving the material and making it available to the users , a commonly seen organization of materials management is divided into an integrated sections as :

- Purchasing
- Stores
- Inspection
- Traffic

1- Purchasing:- Once the whole Materials Management function has been divided into its different sub-functions as above, the sub-functions too are divided into their functions which are usually seen to be as :

Administrative: Purchasing administration involves all the tasks associated with the management process, with emphasis on the development of policies , procedures, controls and the mechanics for coordinating purchasing operations with those of other departments.

- Buying: It addresses to a wide gamut of activities such as reviewing requisitions , analyzing specifications, investigating vendors, interviewing sales people studying costs and prices and negotiating.
-
- Expediting: This is basically the order follow up activity involving various types of vendor relationship work.

- Reviewing Order status, providing clarifications on transportation, writing and emailing vendors etc.

- Special projects (Non routine) : In order to facilitate smooth purchasing in a highly competitive business environment , purchasing authorities have to keep building the capacity to do better by taking up as special projects activities such as vendor development, vendor registration, value analysis, market studies, system studies etc
-
- Routine : Purchasing process or procedure involving routine or every day activities such as dealing specific purchase file , placing orders, maintaining records of commodities, vendors etc.

1.5.1 Purchasing

Purchasing refers to a business or organization attempting to acquire goods or services to accomplish the goals of the enterprise. Though there are several organizations that attempt to set standards in the purchasing process, processes can vary greatly between organizations. Typically the word "purchasing" is not used interchangeably with the word "procurement", since procurement typically includes Expediting, Supplier Quality, and Traffic and Logistics (T&L) in addition to Purchasing.

Overview

Purchasing managers/directors, and procurement managers/directors guide the organization's acquisition procedures and standards. Most organizations use a three-way check as the foundation of their purchasing programs. This involves three departments in the organization completing separate parts of the acquisition process. The three departments do not all report to the same senior manager to prevent unethical practices and lend credibility to the process. These departments can be purchasing, receiving; and accounts payable or engineering, purchasing and accounts payable; or a plant manager, purchasing and accounts payable. Combinations can vary significantly, but a purchasing department and accounts payable are usually two of the three departments involved.

Historically, the purchasing department issued Purchase Orders for supplies, services, equipment, and raw materials. Then, in an effort to decrease the administrative costs associated with the repetitive ordering of basic consumable items, "Blanket" or "Master" Agreements were put into place. These types of agreements typically have a longer duration and increased scope to maximize the Quantities of Scale concept. When additional supplies are required, a simple release would be issued to the supplier to provide the goods or services.

Another method of decreasing administrative costs associated with repetitive contracts for common material, is the use of company credit cards, also known as "Purchasing Cards" or simply "P-Cards". P-card programs vary, but all of them have internal checks and audits to ensure appropriate use. Purchasing managers realized once contracts for the low dollar value consumables are in place, procurement can take a smaller role in the operation and use of the contracts. There is still oversight in the forms of audits and monthly statement reviews, but most of their time is now available to negotiate major purchases and setting up of other long term contracts. These contracts are typically renewable annually.

This trend away from the daily procurement function (tactical purchasing) resulted in several changes in the industry. The first was the reduction of personnel. Purchasing departments were now smaller. There was no need for the army of clerks processing orders for individual parts as in the past. Another change was the focus on negotiating contracts and procurement of large capital equipment. Both of these functions permitted purchasing departments to make the biggest financial contribution to the organization. A new terms and job title emerged –Strategic sourcing and Sourcing Managers. These professionals not only focused on the bidding process and negotiating with suppliers, but the entire supply function. In these roles they were able to add value and maximize savings for organizations. This value was manifested in lower inventories, less personnel, and getting the end product to the organization's consumer quicker. Purchasing manager's success in these roles resulted in new assignments outside to the traditional purchasing function – logistics, materials management, distribution, and warehousing. More and more purchasing managers were becoming Supply Chain Managers handling additional functions of their organizations operation. Purchasing managers were not the only ones to become Supply Chain Managers. Logistic managers, material managers, distribution managers, etc all rose the broader function and some had responsibility for the purchasing functions now.

In Accounting, purchases are the amount of goods a company brought throughout this year. They are added to Inventory. Purchases are offset by Purchase Discounts and Return & Allowances When it should be added depends on the Free on Board (FOB) policy of the trade. For the purchaser, this new inventory is added on shipment if the policy was FOB shipping point, and the seller remove this item from its inventory. On the other hand, the purchaser added this inventory on receipt if the policy was FOB destination, and the seller removes this item from its inventory when it was delivered.

Goods brought for the purpose other than direct selling, such as for Research & Development, are added to inventory and allocated to Research and Development expense as they are used. On a side note, equipments brought for Research and Development are not added to inventory, but are capitalized as assets

1.5.2 Selection of Bidders

This is the process where the organization identifies potential suppliers for specified supplies, services or equipment. These suppliers' credentials (qualifications) and history are analyzed, together with the products or services they offer. The bidder selection process varies from organization to organization, but can include running credit reports, interviewing management, testing products, and touring facilities. This process is not always done in order of importance, but rather in order of expense. Often purchasing managers research potential bidders obtaining information on the organizations and

products from media sources and their own industry contacts. Additionally, purchasing might send Request for Information (RFI) to potential suppliers to help gather information. Engineering would also inspect sample products to determine if the company can produce products they need. If the bidder passes both of these stages engineering may decide to do some testing on the materials to further verify quality standards.

1.5.3 Bidding Process

This is the process an organization utilizes to procure goods, services or equipment. Processes vary significantly from the stringent to the very informal. Large corporations and governmental entities are most likely to have stringent and formal processes. These processes can utilize specialized bid forms that require specific procedures and detail. The very stringent procedures require bids to be open by several staff from various departments to ensure fairness and impartiality. Responses are usually very detailed. Bidders not responding exactly as specified and following the published procedures can be disqualified. Smaller private businesses are more likely to have less formal procedures. Bids can be in the form of an email to all of the bidders specifying products or services. Responses by bidders can be detailed or just the proposed dollar amount.

Most bid processes are multi-tiered.

1.5.4 Acquisition Process

The revised acquisition process for major systems in industry and defense is shown in the next figure. The process is defined by a series of phases during which technology is defined and matured into viable concepts, which are subsequently developed and readied for production, after which the systems produced are supported in the field.

The process itself includes four phases of development

- Concept and Technology Development: is intended to explore alternative concepts based on assessments of operational needs, technology readiness, risk, and affordability.
- Concept and Technology Development phase begins with concept exploration. During this stage, concept studies are undertaken to define alternative concepts and to provide information about capability and risk that would permit an objective comparison of competing concepts.
- System Development and Demonstration phase. This phase could be entered directly as a result of a technological opportunity and urgent user need, as well as having come through concept and technology development.
- The last, and longest, phase is the Containment and Disposal phase of the program. During this phase all necessary activities are accomplished to maintain and sustain the system in the field in the most cost-effective manner possible.

Material Planning

In any integrated Materials Management environment, planning for getting the materials is the starting point for the whole MM function. Materials planning set the procurement function and the subsequent material functions rolling.

Material planning is a scientific way of determining the requirements starting with raw materials, consumables, spare parts and all other materials that are required to meet the given production plan for a certain period. Material planning is derived from the over all organizational planning and hence it is always a sub-plan of the broad organizational plan. What it does is forecasting and initiating for procurement of materials

Factors affecting Material planning:

1) Macro factors : Global factors such as price trends, business cycles, government's import and export policies etc are called the Macro factors. Credit policy of the government is a critical factor as banks follow these guidelines only while extending financial support to a business entity.

2) Micro factors: These are essentially the factors existing within the organization such as corporate policy on Inventory holding, production plan, investments etc. For any organization, factors such as Lead time of procurement, acceptable inventory levels, working capital, seasonality, delegation of power are micro factors.

Techniques of planning materials:

There are a few techniques used for planning material for the given period. The following two are, however, commonly used:

1) Materials Requirement Planning (ERP)

2) Requirement based on past consumption

1-Material Requirement Planning:-

ERP has, as its starting point, the annual production plan of the manufacturing concern. Once a firm determines its annual production plan, the over all material requirement, to meet the given production plan, is worked out. It is a detailed analysis encompassing the materials and quantities available for use, materials with quantities not available and hence needing procurement, the actual lead time of procurement etc.

Since, it is always possible to have a situation where some parts of an assembly are available and some others not available, Bill of Materials is exploded. It is quantifying all the materials (components) needed for various assemblies, all needed as per the production plan. BOM is thus a list displaying the code, nomenclature of an item, its unit and quantity, location of use and also the estimated price of each component.

An explosion chart is a series of bills of materials grouped together in a matrix form so that combining the requirements for different components can be made. Once the BOM is ready, the same is handed over to the Purchasing wing which initiates the purchasing activities. ERP thus keeps in view the Lead time also. Using computers, preparation of BOM through explosion of lists is quite easy and smooth

2-Techniques of Material planning:-

- JIT
- Kanban
- Push Or Pull

3-Requirement of material planning:-

An MP system is intended to simultaneously meet three objectives:

- Ensure Materials and products are available for production and delivery to customers.
- Maintain the lowest possible level of inventory.
- Plan manufacturing activities, delivery schedules and purchasing activities

The basic objective of the material planning is to perform the manufacturing operation in a proper way thus they can achieve the desired results.

Manufacturing organizations, whatever their products, face the same daily practical problem - that customers want products to be available in a shorter time than it takes to make them. This means that some level of planning is required.

Companies need to control the types and quantities of materials they purchase, plan which products are to be produced and in what quantities and ensure that they are able to meet current and future customer demand, all at the lowest possible cost. Making a bad decision in any of these areas will make the company lose money. A few examples are given below:

- If a company purchases insufficient quantities of an item used in manufacturing, or the wrong item, they may be unable to meet contracts to supply products by the agreed date.
- If a company purchases excessive quantities of an item, money is being wasted - the excess quantity ties up cash while it remains as stock and may never even be used at all. However, some purchased items will have a minimum quantity that must be met, therefore, purchasing excess is necessary.
- Beginning production of an order at the wrong time can cause customer deadlines to be missed.

ERP is a tool to deal with these problems. It provides answers for several questions:

- What items are required?
- How many are required?
- When are they required?

ERP can be applied both to items that are purchased from outside suppliers and to sub-assemblies, produced internally, that are components of more complex items.

The data that must be considered include:

- The *end item* (or items) being created. This is sometimes called Independent Demand, or Level "0" on BOM (Bill Of material)
- How much is required at a time.
- When the quantities are required to meet demand.
- Shelf life of stored materials.
- Inventory status records. Records of *net* materials *available* for use already in stock (on hand) and materials on order from suppliers.
- Bills of materials. Details of the materials, components and subassemblies required to make each product.
- Planning Data. This includes all the restraints and directions to produce the end items. This includes such items as: Routings, Labor and Machine Standards, Quality and Testing Standards, Pull/Work Cell and Push commands, Lot sizing techniques (i.e. Fixed Lot Size, Lot-For-Lot, Economic Order Quantity), Scrap Percentages, and other inputs.

Outputs

There are two outputs and a variety of messages/reports:

- Output 1 is the "Recommended Production Schedule" which lays out a detailed schedule of the required minimum start and completion dates, with quantities, for each step of the Routing and Bill Of Material required to satisfy the demand from the MPS.
- Output 2 is the "Recommended Purchasing Schedule". This lays out both the dates that the purchased items should be received into the facility AND the dates that the Purchase Order or Blanket Order Release should occur to match the production schedules.

Messages and Reports:

- Purchase Order. An order to a supplier to provide materials.
- Reschedule notices. These *recommend* canceling, increasing, delaying or speeding up existing orders.

Note that the *outputs* are *recommended*. Due to a variety of changing conditions in companies, since the last ERP / ERP system Re-Generation, the recommended outputs need to be reviewed by *trained* people to group orders for benefits in set-up or freight savings. These actions are beyond the linear calculations of the ERP computer software.

Bill of materials (BOM) is the term used to describe the raw materials, sub-assemblies, intermediate assemblies, sub-components, components, parts and the quantities of each needed to manufacture a

final product It may be used for communication between manufacturing partners or confined to a single manufacturing plant.

A BOM can define products as they are designed Engineering bill of material), as they are ordered (sales bill of material), as they are built Manufacturing Bill of Material), or as they are maintained (service bill of material). The different types of BOMs depend on the business need and use for which they are intended. In process industries, the BOM is also known as the *formula*, *recipe*, or *ingredients list*. In electronics, the BOM represents the list of components used on the printed wiring board or printed circuit board. Once the design of the circuit is completed, the BOM list is passed on to the PCB layout engineer as well as component engineer who will procure the components required for the design.

BOMs are hierarchical in nature with the top level representing the finished product which may be a sub-assembly or a completed item. BOMs that describe the sub-assemblies are referred to as Modular BOMs An example of this is the NAAMS BOM that is used in the automotive industry to list all the components in an assembly line. The structure of the NAAMS BOM is System, Line, Tool, Unit and Detail.

The first hierarchical databases were developed for automating bills of materials for manufacturing organizations in the early 1960s. A bill of materials "implosion" links component pieces to a major assembly, while a bill of materials "explosion" breaks apart each assembly or sub-assembly into its component parts.

A BOM can be displayed in the following formats:

- A **single-level BOM** that displays the assembly or sub-assembly with only one level of children. Thus it displays the components directly needed to make the assembly or sub-assembly.
- An **indented BOM** that displays the highest-level

1.5.5 Technical Evaluation

Technical Evaluations, evaluations of the technical suitability of the quoted goods or services, if required, are normally performed prior to the Commercial Evaluation. During this phase of the procurement process, a technical representative of the company (usually an engineer) will review the proposal and designate each bidder as either technical acceptable or technically unacceptable.

1.5.6 Commercial Evaluation

Payment Terms

Cost of Money - Cost of Money is calculated by multiplying the applicable currency interest rate multiplied by the amount of money paid prior to the receipt of GOODS. If the money were to have remained in the Buyer's account, interest would be drawn. That interest is essentially an additional cost associated with such Progress or Milestone payments.

Manufacturing Location - The manufacturing location is taken into consideration during the evaluation stage primarily to calculate freight costs and regional issues which may be considered. For instance, in Europe in is common for factories to close during the month of August for Summer holiday. Labor agreements may also be taken into consideration and may be drawn into the evaluation if the particular region is known to frequent labor unions.

Manufacturing Lead-Time - the manufacturing lead-time is the time from the placement of the order (or time final drawings are submitted by the Buyer to the Seller) until the goods are manufactured and prepared for delivery. Lead-times vary by commodity and can range from several days to years.

Transportation Time - Transportation time is evaluated while comparing the delivery of goods to the Buyer's required use-date. If Goods are shipped from a remote port, with infrequent vessel transportation, the transportation time could exceed the schedule adjustments would need to be made.

Delivery Charges - the charge for the Goods to be delivered to a stated point. Bid Validity Packing Bid Adjustments Terms and Conditions Seller's Services Standards Organizations Financial Review Payment Currency Risk Analysis - market volatility, financial stress within the bidders Testing

Purchasing Procedures

Structure

2.1 Purchasing

- 2.1.1 Purchase Procedure
- 2.1.2 Profit Making Centre
- 2.1.3 Procurement Vs. Purchasing
- 2.1.4 Objective of Purchasing
- 2.1.5 Type of Purchasing

2.2 Purchasing Systems

- 2.2.1 Pre-purchase (Ordering) system;
- 2.2.2 Ordering system;
- 2.2.3 Post-purchase (Ordering) system

2.3 Pricing Objectives

- 2.3.1 Pricing Strategies
- 2.3.2 Types Pricing strategies
- 2.3.3 Option for Increasing Sales
- 2.3.4 Summary

2.4 Selection of Source (Supplier)

- 2.4.1 Commercial Evaluation
- 2.4.2 Cost of Money
- 2.4.3 Manufacturing Location
- 2.4.4 Manufacturing Lead-Time
- 2.4.5 Transportation Time
- 2.4.6 Delivery Charges

2.5 Vendor management, Legal aspects e-procurement purchase auction

- 2.5.1 Vendor Registration
- 2.5.2 Vendor Development
- 2.5.3 Vendor Rating
- 2.5.4 Vendor Exploration

PURCHASING

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Purchasing function, in a business environment, is one of the most critical functions as it provides the input for the organization to convert into output. Materials today are lifeblood of industry. They must be available at the proper time, in the proper quantity, at the proper place, and the proper price. Company costs and company profits are greatly affected by them as normally, a manufacturing organization spends nearly 50% of its revenue in purchasing.

Purchasing managers/directors, and procurement managers/directors guide the organization's acquisition procedures and standards. Most organizations use a three-way check as the foundation of their purchasing programs. This involves three departments in the organization completing separate parts of the acquisition process. The three departments do not all report to the same senior manager to prevent unethical practices and lend credibility to the process. These departments can be purchasing, receiving; and accounts payable or engineering, purchasing and accounts payable; or a plant manager, purchasing and accounts payable. Combinations can vary significantly, but a purchasing department and accounts payable are usually two of the three departments involved.

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2.1.1 Purchase Procedure

A typical purchase department is usually engaged in purchasing a number of materials and services falling in different categories. The activities are performed regularly by purchase professionals with the objective of fulfilling organization's materials and services needs.

Naturally, depending upon the nature of procurement, environmental practices etc the purchasing systems and procedures may also vary substantially. However, purchase procedure can be seen to have a bit of standardization across the globe and therefore a professional purchasing system does show following steps that eventually constitute a purchasing cycle.:

- Recognition & description of need
- Transmission of need
- Selection of source to satisfy the need
- Contracting with the accepted source
- Following up with the source
- Receiving and inspecting material
- Payment and closure of the case

Procurement activities in an organization start right since the stage a need is felt for any material or service.

An organization categorizes it's material requirements into two broad ways , viz. Inventory Control item or Non inventory item.

A department within the organization may require an item which is non inventory and thus the department concerned shall have to describe the need.

It implies writing down the specification of the item, the volume (quantity) etc of the item and some other related information to process it further.

For an Inventory item, usually, there is a forecasting method by which the need for an item is addressed

What could be a need?

The need for an item may be at regular interval, one time or even be sporadic in nature. This could be an item needed for running a machine, certain raw material needed for production, a service in terms of maintenance of a machine or for doing certain job needing the employment of labor, materials, machines etc.

Purchasing Function vs. Purchase department

Purchasing function is a function commonly seen in all those organizations that undertake purchasing activities. Purchase department is a unit of an organization that performs purchasing function The purchasing function is usually performed by a specialized and centralized purchasing department, directed by an efficient manager to achieve the performance in an economical manner.

2.1.2 Profit making Centre

Purchasing is responsible for spending nearly half of a company's income for buying the input materials. Obviously, any saving achieved by it results into direct saving for the company and all such savings are a company's profit Going by a thumb rule "even 1% saving achieved in Purchasing results in 5% profit for any organisation".

2.1.3 Procurement vs. Purchasing

It is used to define one of several supply functions involved in logistics activities. In the broadest sense procurement includes the entire process by which all classes of resources (people, materials, facilities and services) for a particular project are obtained. Since purchasing is a unique function , it differs a bit from procurement in the sense that while procurement , with the same objective has a wider domain , purchasing with the same objective is included in it !

2.1.4 Objectives of Purchasing

The classical definition of objectives of purchasing is to buy materials and services of the right quality , in the right quantity, at the right place , from the right source and at the right time. However , in general management parlance the objectives of purchasing are:

- To support company operations with an uninterrupted flow of materials and services.
- To buy competitively and wisely
- To help keep a minimum Inventory
- To develop reliable alternate sources of supply
- To develop good vendor relationship and a good continuing supplier relationship
- To achieve maximum integration with the other departments of the firm
- To train and develop highly competent personnel
- who are motivated to make the firm as well as their department succeed
- To develop policies and procedures which permit accomplishment of the preceding seven objectives at the lowest reasonable operating cost

The basic objective, in pure practical terms is, of course, to derive the maximum value for each unit of currency spent in buying. Purchase is no doubt a vast subject & as the competition among the firms is grow this function of business a expected to see a lot of evolution.

2.1.5 Types of purchasing

Considering the nature of business an organization has there could be different approaches & hence purchasing can be any of these types:

- Forward purchasing
- Tender purchasing
- Speculative purchasing
- Rate Contract
- Reciprocity
- Zero store buying
- Blankest order
- Forward Buying:

Forward Buying as the name suggests is the system under which buying is done with longer term in perspective. It is not meant for meeting the present consumption requirement. It is rather a commitment on part of both the buyer and the seller, normally for a period of one year. Depending upon the availability of the item, the financial policies, the economic order quantity, the quantitative discounts, and the staggered delivery, the future commitment is decided. A few organizations do “hedge”, particularly in the commodity market by selling or buying contracts. Forward buying helps a firm in booking capacity of a supplier and thus often results into a safeguard against a competitor acquiring his capacity.

It is usually done for Raw materials but is not limited to it. Now a days , with competition becoming globalize such an arrangement is a win-win situation for both , the buyer and the supplier.

Tender Buying:

Purchasing through tendering is most common in government and public sector buying where besides restricted expenditure on buying transparency in the buying process also is important. Tender basically is the quotation submitted by the interested vendors against Tender notices which are invitations extended to the prospective vendors to quote for the given material depending upon situations, tendering too has various modes that is types.

Open Tender: In a situation where the sources of supply that is vendors are not known or there are likelihood of getting more responses from unknown sources then Open tendering is resorted to. This is done through large scale reachable media such as Internet, Newspapers or leading trade journals.

Systems Contracting:

Systems contract, as the term suggest, is a contract of system of buyer with that of the seller. It is a release system in which items, usually, commonly available off-the-shelf, are identified and pre-priced in anticipation of certain usage. Delivery releases are made against existing orders placed by purchase. This is a procedure intended to help the buyer and the seller to reduce administrative expenses and at the same time to ensure proper controls. The system authorizes the designated persons of the buyer to place orders directly to the supplier with the specific materials during a given contract period. The contract is thus finalized only after it is ensured that an attempt has been made to integrate as many buyer-seller materials management functions as possible.

In this system the original indent, duly approved by competent authorities, is shipped back with the items and avoiding the usual documents like purchase orders, materials requisitions, expediting letters and acknowledgements, goods in transit report, etc. The contract is simple, covering only delivery period, price and invoicing procedure. Systems contracting are particularly useful for items with low unit price and high consumption profile and thus relieve the buyers of the routine work.

While Systems contract has certain features in common with other purchasing agreements, it is this integration of buyer-seller operations that clearly distinguishes it from other types of contracts.

Speculative Buying

When purchasing is done purely from the point of view of taking advantage of a speculated rise in price of the commodity it is called Speculative buying. The intent is not to buy for the internal consumption but to resell the commodity at a later date when the prices have gone up and to make a profit by selling. The items may be those that are needed for internal consumption but the quantity shall be much more than the requirement so as to take advantage of the coming price rise.

Rate Contracts:

Rate contracts are mutual agreements between the buyer and the seller to operate a set of chosen items, during a given period of time, for a fixed price or price variation. Under this system the rates are fixed and at times even the quantity of the selected items. As and when the need arises the buyer issues a

Purchase order directly on the basis of the rate chart available on the supplier who in turn supplies the items.

The system of rate contract is prevalent in public sector organist ions and government departments. It is common for the suppliers to advertise that they are on "rate contract" with the DGS & D (Directorate General of Supply & Distribution), for the specific period the given items. After negotiation, the seller and the buyer agree to the rates of items. Application of rate contract helps organizations cut down the internal administrative lead time as individual firms need not go through the central purchasing departments and can place orders directly with the suppliers.

However, suppliers always demand higher prices for prompt delivery, as rate contracts normally stipulate only the rate and not the schedule on which the item is needed. This difficulty has been avoided by ensuring the delivery of a minimum quantity at the agreed rates. This procedure of fixing a minimum quantity is called the running contract and is being practiced by the railways and the DGS&D.

Reciprocity in Buying:-

In certain business situations a buyer may give preference to a supplier who also happens to be his customer. This relationship is known as reciprocity. It is something like "I buy from you if you buy from me"

One of the main questions for which this, otherwise simple way of buying, is always under the scanner of purchasing ethics is its undue ability to restrict competition and fair play. One of the major roles that any purchaser plays for his firm is in cost reduction arena which is attempted by generating competition among the suppliers. This principle gets a jolt through reciprocity in buying. However, when factors such as quality, after sales service, prices etc are equal normally a buyer would like to buy from his customer, if for nothing then at least for having a good working relationship. However, the distinct disadvantages of reciprocal buying outweigh the limited and narrow advantage that a firm may out of it.

A purchasing executive should not indulge in reciprocity on his initiative when the terms and conditions are not equal with other suppliers. It is often found that less efficient manufacturers and distributors gain by reciprocity what they are unable to gain by price and quality. Since this tends to discourage competition and might lead to higher prices and fewer suppliers, reciprocity should be practiced on a selective basis

Zero Stock Buying

Zero Stock Buying refers to buying in a manner that the system ensures that the material is delivered by the seller only when it is required and that no prior inventory of the item is maintained by the buyer. As the competition becomes more intense the need for a lean manufacturing system becomes more focused. Keeping inventory thus is blocking huge money that is idle for the firm. Thus Zero stock buying is more of an inventory safeguard rather than the normal buying.

Normally, under this system the firms try to operate on the basis of zero stock and the supplier holds the stock for these firms. Usually, the firms of the buyer and seller are close to each other so that the raw material of one is the finished product of another. Alternatively, the system could work well if the seller holds the inventory and if the two parties work in close coordination. However the price per item in this system is slightly higher as the supplier may include the inventory carrying cost in the price. In this system, the buyer need not lock up the capital and so the purchasing routine is reduced. This also significantly reduces obsolescence of inventory, lead time and clerical efforts in paper work.

For example, in India, say the Indian Oil Limited maintains its petrol and diesel refilling stations inside the manufacturing premises of many companies. As and when petrol or diesel is required, say in a lorry, IOL fills that and a coupon is signed by the driver of the lorry. Buyer makes the payment to IOL against that coupon.

Blanket Orders

Under this system an agreement is done between the buyer and the supplier to provide a required quantity of specified items, over a period of time, usually for one year, at an agreed price. This system minimizes the administrative expenses and is useful for 'C' class items for which rigid controls are not required. Deliveries are made depending upon the buyer's needs. The system relieves the buyer from routine work, giving him more time for focusing attention on high value items such as 'A' and part of 'B' class. It requires fewer purchase orders and thus reduces clerical work. It often achieves lower prices through quantity discounts by grouping the requirements. The supplier, under the system, maintains adequate inventory to meet the blanket orders, but he does not incur selling costs, once the negotiations are finalized.

2.2 PURCHASING SYSTEMS

For any organization, purchasing function assumes importance for the reason that it fulfills, to a great extent, the input needs of the organization. Whether product or service, an organization needs input of right quality, at right price, from the right source in right quantity at the right time. Often called 5 R's (right things to do) these determine the broad parameters within which purchasing functions in any organization. Depending upon the size and nature of operation, the quantum of purchase of product and services vary. In some organizations the total purchase bill is to the tune of 60% of its annual expenditure!!

Obviously, for any organization engaged in a continuous set of activities, where inputs are processed, on a regular basis for producing outputs, formalized systems and procedures are required to run its purchasing function, to ease in operation and accountability. Formal procedures are required to be laid down for initiating purchase, selecting suppliers, placing purchase orders, follow-up, receiving materials and so on.

The whole system of purchasing, in terms of phases or grouping of related activities can be classified as follows:

2.2.1 Pre-purchase (Ordering) system

The salient features in each of the systems mentioned are as follows :

(**1) Pre-purchase system :** Activities such as initiating the purchase through raising requisitions, requirement programs, selection of suppliers, obtaining quotations and evaluating them, are broadly the pre-purchase activities.

(A) Requisitions: The department concerned (within the organization), in need of a material, usually presents a completed requisition form. Different types of requisitions used are:

(B) Standard Requisition: - Also called as Indent for material (or service), Materials requisition plan etc. a requisition is made by an authorized person in the concerned department. However, it has to be countersigned by a senior officer who checks the entries made in. Normally, a requisition , in a pre printed format, contains particulars such as the detailed description of materials or services to be purchased, desired quantity, schedule for receipt of such material / service , the estimated price, possible sources and the account head, requisitioner's identity

In any organization only a limited number of personnel are empowered to countersign the requisition as it amounts to authorization of the expenditure. Purchase department usually maintains a list of such officers so as to check the validity of the purchase requisitions. Normally, there is a delegation of power of authority for authorizing a requisition. This is expressed in terms of the financial limits up to which an officer can authorize a requisition for a capital or revenue item.

These details must also be available with the purchase department.

(II) Traveling requisition: As the name suggests, this requisition form travels from the requisitioning department to the Purchaser directly who then only authorizes the supplier through a Purchase order to deliver the required material. This document is generally used for requisitioning items that are required frequently in bulk quantities over a long period of time. Usually, for repeat items such as in inventory a card containing the details of previous supply containing material specifications, suppliers details, last purchased price , reorder point, usage details are written permanently and provisions for entering date, quantity required, names of requisitioned and authorizer are available. On getting it , the purchaser only has to take these details for placement of order. The traveling requisition which is a permanent document of the originating department is returned to it. It reduces the paper work and eases the operation

Bills of materials: Bill of material is a comprehensive list of materials needed to produce a product or service. It is basically the details of materials needed, their specification, quantity, required delivery schedule etc. It is often used as a sequel to firming of a production plan, a stage where the exact material / service needs are known.

(B) Request for Quotation (RFQ): Also called as Tender Enquiries, an organization through its Purchase department, invites suppliers to quote rates for supply of materials / service. This is the step taken after receiving the requisition for an item. For this purpose often a standard format is used

(customized also in case of large contracts). Against this document the prospective vendors quote their price and other terms and conditions of sale.

C) Quotation: It is also called tender. A quotation is a proposal from a prospective vendor who has quoted in response to the RFQ sent to him by the purchaser. It contains price offered by the vendor as also the terms and conditions of sale as per the policy of the vendor.

2.2.2 Ordering System

After the offers (quotation / tender) are received and evaluated in respect to their fulfillment of the organizational requirement the appropriate supplier for his quoted rates is selected. This is expressed in terms of the buyer placing the formal purchase order on him. The purchase order containing suitable business terms and conditions is now a binding contract between the buyer and the supplier.
A typical Purchase Order contains the following particulars:

(a) Purchase order reference number, as a communicating mode between the supplier and the buyer for linking of various subsequent correspondences
(b) Material description with detailed specifications,
(c) Quantity ordered
(d) Required Delivery schedule,
(e) Price , discounts, taxes and duties applicable
(f) Terms and conditions of purchase in details
(g) Destination where the materials are to be delivered (usually the name and address of the consignee),
(h) Shipping instructions,
(i) Authorization of the Materials Manager who signs the purchase order

The Purchase Order is made in multiple copies that are sent after their release from the Materials Manager to several agencies such as:

i) Supplier, with the original and a copy which the supplier is supposed to sign and return to the buyer as a mark of acceptance of the P.O.

ii) Indentors, as an information of order placement and for taking steps as provided for in the P.O.

iii) Finance, for making payment as per the provision of the P.O.

iv) Consignee , for receiving the material and clearing it for subsequent use by the organization

These are the indicative list and not the exhaustive one

2.2.3 Post-Purchasing System

Purchase orders are placed for getting material or service. As such after P.O. placement, follow-up with suppliers, receipt of material and making payment ,once the materials have been received are involved.

Generally, in case of relatively big orders, many small jobs are required to be done as part of follow up with the supplier. Since after the P.O. the executive authority (usually the Indenter) comes into play ,

action such as receipt and clearance of drawing with supplier, clearing various doubtful issues contained in the P.O., at times, are involved. Also since the P.O. indicates a clear delivery schedule, the buyer is often required to chase up for ensuring that. In the process, the following action may be required:

(i) Receipt and clearance of drawing and documents submitted by the supplier

ii) Inspection, in part or full, of the material being manufactured by the supplier

iii) Handing over of site to the supplier to effect installation and commissioning

iv) Making available the necessary Goods carrying documents to the supplier

Inspection of the manufactured goods is often a major post purchase order activity. Large organizations usually have location offices called site offices spread across the country for carrying out inspection, ensuring dispatch of material and liasoning with many other agencies. Critical items require regular follow-up with the supplier. A few organizations operate with decentralized inspection facilities for on-the-spot inspection and acceptance. Purchase Order (P.O.) status reports are prepared so that follow-up is done where ever required. Once the material is received at the described site final inspection is carried out for its acceptance. In the process, adequate documentation is generated. On the basis of the item code, proper identification tag etc is attached. In fact, now the procedure is taken over by the Stores / Warehouse wing.

Payment release: The supplier also sends the invoice for the materials supplied for payment. On receipt of it the invoice is matched against the receipt details, quantity accepted etc so that payments can be made as per the agreed term of the P.O. Normally, invoices are sent to the finance department who releases the payment after following the procedure at its end.

2.3 PRICING OBJECTIVES

A critical part of a company's overall strategic planning includes the establishment of pricing objectives for the products it sells. A company has several pricing objectives from which to choose, and the objective chosen will depend on the goals and type of product sold by a company. The four most commonly adopted pricing objectives are (1) competitive, (2) prestige, (3) profitability, and (4) volume pricing.

Competitive pricing the concept behind this frequently used pricing objective is to simply match the price established by an industry leader for a particular product. Since price difference is minimized with this strategy, a company focuses its efforts on other ways to attract new customers. Some examples of what a company might do in order to obtain new customers include producing high-quality and reliable products, providing superior customer service, and/or engaging in creative marketing.

Prestige pricing a company may chose to promote, maintain, and enhance the image of its product through the use prestige pricing, which involves pricing a product high so as to limit its availability to the higher-end consumer. This limited availability enhances the product's image, causing it to be

viewed as prestigious. Although a company that uses this strategy expects to have limited sales, this is not a problem because a profit is still possible due to the higher markup on each item. Examples of companies that use prestige pricing are Mercedes-Benz and Rolls Royce.

Profitability pricing the basic idea behind profitability pricing is to maximize profit. The basic formula for this objective is that profits equal revenue minus expenses (P = R - E). Revenue is determined by a product's selling price and the number of units sold. A company must be careful not to increase the price of the product too much, or the quantity sold will be reduced and total profits may be lower than desired. Therefore, a company is always monitoring the price of its products in order to make sure it is competitive while at the same time providing for an acceptable profit margin.

Volume Pricing When a company uses a volume-pricing objective; it is seeking sales maximization within predetermined. A company using this objective prices a product lower than normal but expects to make up the difference with a higher sales volume. Volume pricing can be beneficial to a company because its products are being purchased on a large scale, and large-scale product distribution helps to reinforce a company's name as well as to increase its customer loyalty. A subset of volume pricing is the market-share objective, the purpose of which is to obtain a specific percentage of sales for a given product. A company can determine an acceptable profit margin by obtaining a specific percentage of the market with a specific price for a product.

2.3.1 Pricing Strategies

Companies can chose from a variety of pricing strategies, some of the most common being penetration, skimming, and competitive strategies. While each strategy is designed to achieve a different goal, each contributes to a company's ability to earn a profit.

2.3.2 Types of Pricing Strategies

Penetration Pricing Strategy A company that wants to build market share quickly and obtain profits from repeat sales generally selects the penetration pricing strategy, which can be very effective when used correctly. For example, a company may provide consumers with free samples of a product and then offer the product at a slightly reduced price. Alternatively, a company may initially offer significant discounts and then slowly remove the discounts until the full price of the product is listed. Both options allow a company to introduce a new product and to start building customer loyalty and appreciation for it. The idea is that once consumers are familiar with and satisfied with a new product, they will begin to purchase the product on a regular basis at the normal retail price.

Price Skimming Strategy price-skimming strategy uses different pricing phases over time to generate profits. In the first phase, a company launches the product and targets customers who are more willing to pay the item's high retail price. The profit margin during this phase is extremely high and obviously generates the highest revenue for the company. Since a company realizes that only a small percentage of the market was penetrated in the first phase, it will price the product lower in the second phase. This second phase pricing will appeal to a broader cross-section of customers, resulting in increased product sales. When sales start to level off during this phase, the company will price the product even lower. This third-phase pricing should appeal to those consumers who were price-sensitive in the first two phases and result in increased sales. The company should now have covered the majority of the market

that is willing to purchase its product at the high, medium, and low price ranges. The price-skimming strategy provides an excellent opportunity for the company to maximize profits from the beginning and only slowly lower the price when needed because of reduced sales. Price adjustment with this strategy closely follows the product life cycle, that is, how customers accept a new product. Price skimming is a frequently used strategy when maximum revenue is needed to pay off high research and development costs associated with some products.

Competitive Pricing Strategy Competitive pricing is yet another major strategy. A company's competitors may either increase or decrease their prices, depending upon their own objectives. Before a company responds to a competitor's price change with one of its own, a thorough analysis as to why the change occurred needs to be conducted. An investigation of price increases or decreases will usually result in one or more of the following reasons for the change: a rise in the price of raw materials, higher labor costs, increasing tax rates, or rising inflation. To maintain an acceptable profit margin for a particular product, a company pricing strategy frequently.

When competitors decrease their prices, a company has numerous options. The first option is to maintain its price, since the company is confident that consumers are loyal and value its unique product qualities. Depending on the price sensitivity of customers in a given market, this might *not* be an appropriate strategy for a company to use. The second is to analyze why a competitor might have decreased its prices. If price decreases are due to a technological innovation, then a price decrease will probably be necessary because the competitor's price reduction is likely to be permanent. Regardless of its competitor's actions, a company may decrease its price. This price reduction option is called *price covering*. This option is most useful when a company has done a good job of differentiating the qualities of its product from those of a competitor's product. will usually increase the price. In addition, strong consumer demand for a particular product may cause a shortage and, therefore, allow a company to increase its price without hurting either demand or profit.

When a competitor increases its price, a company has several options from which to chose. The first is to increase its price to approximately the same as that of the competing firm. The second is to wait before raising its price, a strategy known as *price shadowing*. Price shadowing allows the company to attract new customers—those who are price-sensitive— away from the competing firm. If consumers do switch over in large numbers, a company will make up lost profits through higher sales volume. If consumers do not switch over after a period of time, the company can increase its price. Typically, a company will increase its price to a level slightly below that of its competitors in order to maintain a lower-price tactical advantage. The airline industry uses the competitive On the flip side, the advantage of price covering is reduced when no noticeable difference can be seen between a company's product and that of a competitor.

2.3.3 Options for Increasing Sales

Companies have several options available when attempting to increase the sales of a product, including coupons Prepayment, price shading, seasonal pricing, term pricing, segment pricing, and volume discounts.

Coupons Almost all companies offer product coupons, reflecting their numerous advantages. First, a company might want to introduce a new product, enhance its market share, increase sales on a mature

product, or revive an old product. Second, coupons can be used to generate new customers by getting customers to buy and try a company's product—in the hope that these trial purchases will result in repeat purchases. A variety of coupon distribution methods are available, such as Sunday newspapers and point-of-purchase dispensers.

Prepayment: A prepayment basic used customers who have no or a poor credit history. This prepayment method does not generally provide customers with a price break. There are, however, prepayment methods that do reduce the price of a product. For example, the prepayment strategy is widely used in the magazine industry. A customer who agrees to purchase a magazine subscription for an extended period of time normally receives a discount as compared to the newsstand f gift certificates is another example of how prepayment can be used to promote sales. For example, a company may offer discounts on a gift certificate whereby the purchaser may only pay 90 to 95 percent of the gift certificate's face value. There are several advantages of using this strategy. First, consumers are encouraged to buy from the company offering the gift certificates rather than from other stores. Second, the revenue is available to a company for reinvestment prior to the product's sale. Finally, receivers will not redeem certificates, and as a result, a company retains all the revenue.

Price Shading One way to increase company sales is to allow salespeople to offer discounts on the product's price. This tactic, known as price shading, is normally used with aggressive buyers in industrial markets who purchase a product on a regular basis and in large volumes. Price shading allows salespeople to offer more favorable terms to preferred industrial buyers in order to encourage repeat sales.

Seasonal Pricing The price for a product can also be adjusted based on seasonal demands. Seasonal pricing will help move products when they are least salable, such as air conditioners in the winter and snow blowers in the spring. An advantage of seasonal pricing is that the price for a product is set high during periods of high demand and lowered as seasonal demand drops off to clear inventory to make room for the current season's products.

Term Pricing A company has another positive reinforcement strategy for use when establishing product price. For example, a company may offer a discount if the customer pays for the product promptly. The definition of promptly varies depending on company policy, but normally it means the account balance is to be paid in full within a specific period of time; in return, a company may provide a discount to encourage continuation of this early payment behavior by the customer. This term pricing strategy is normally used with large retail or industrial buyers, not with the general public. Occasionally, a company will offer a small discount to customers who pay for a product with cash.

Segment Pricing Segment pricing is another tactic a company can use to modify product price in order to increase sales. Everyday examples of segment pricing discounts are those extended to children, senior citizen, and students. These discounts have several positive benefits. First, the company is appearing to help those individuals who are or are perceived to be economically disadvantaged, a perception that helps create a positive public relations image for a company. Second, members of those groups who ordinarily may not purchase the product are encouraged to do so. Therefore, a company's sales will increase, which will likely result in increased market share and revenue.

Volume Discounts A common method used by a company to price a product is volume discounting. The idea behind this pricing strategy is simple—if a customer purchases a large volume of a product, the product is offered at a lower price. This tactic allows a company to sell large quantities of its product at an acceptable profit margin. Volume pricing is also useful for building customer loyalty.

2.3.4 Summary

Price is an important component of the four Ps of marketing because it generates revenue. Price is often thought of as the money that this paid for a product or service. Several factors need to be examined when setting a product price. Frequently reviewed factors include legal and regulatory guidelines, pricing objectives, pricing strategies, and options for increasing sales, since all of these factors contribute to the price established for a product.

2.4 SELECTION OF SOURCE (SUPPLIER)

'Sourcing' or 'Selection of source/s' is a major challenge for any Purchasing manager. Source of supply of required materials is basically selection of a suitable supplier. The Purchasing manager has to ensure, getting the material / service from the right source (one of 5 R).

Once the Indent (also called requisition or Material Procurement Requisition/ MPR) is received in the Purchase department, the concerned dealing person scrutinizes it , in respect of:

- The complete specifications including drawings, if required
- Consumption pattern
- Stock in hand and dues in
- Budget availability
- Availability of all prescribed enclosures and certificates,
- Estimates
- Inspection guidelines, if any

On being fully satisfied that the next stage activities i.e. sourcing is now called for, the mode of selection of source, often called mode of tendering is decided. In many firms, if the number of items is not large then the sources are known and on the basis of suppliers record the Purchase order can be placed.

However, in government firms where opportunities are supposed to be given to any eligible supplier, tendering is resorted to. Tendering is a process by which a potential source is contacted through a notice called Notice Inviting Tender (NIT).

The NIT contains the details of material / service required, the terms and conditions applicable for entering into an agreement with the seller, offers made in response to NIT by the probable seller (Bidder) , for finally reaching the point of agreement between the selected bidder and the buyer.

2.4.1 Cost of Money

Cost of Money is calculated by multiplying the applicable currency interest rate multiplied by the amount of money paid prior to the receipt of GOODS. If the money were to have remained in the Buyer's account, interest would be drawn. That interest is essentially an additional cost associated with such Progress or Milestone payments.

2.4.2 Manufacturing Location

The manufacturing location is taken into consideration during the evaluation stage primarily to calculate freight costs and regional issues which may be considered. For instance, in Europe in is common for factories to close during the month of August for Summer holiday. Labor agreements may also be taken into consideration and may be drawn into the evaluation if the particular region is known to frequent labor unions.

2.4.3 Manufacturing Lead

Time - the manufacturing lead-time is the time from the placement of the order (or time final drawings are submitted by the Buyer to the Seller) until the goods are manufactured and prepared for delivery. Lead-times vary by commodity and can range from several days to years.

2.4.4 Transportation Time

Transportation time is evaluated while comparing the delivery of goods to the Buyer's required use-date. If Goods are shipped from a remote port, with infrequent vessel transportation, the transportation time could exceed the schedule an adjustment would need to be made.

Delivery Charges - the charge for the Goods to be delivered to a stated point. Bid Validity Packing Bid Adjustments Terms and Conditions Seller's Services Standards Organizations Financial Review Payment Currency Risk Analysis - market volatility, financial stress within the bidders testing

2.5 VENDOR MANAGEMENT, LEGAL ASPECTS E-PROCUREMENT PURCHASE AUCTION

A Vendor Management System (VMS) is an Internet often Web-based application that acts as a mechanism for business to manage and procure staffing services – temporary, and, in some cases, permanent placement services – as well as outside contract or contingent labor. Typical features of a VMS application include order distribution, consolidated billing and significant enhancements in reporting capability that outperforms manual systems and processes

Prerequisite to a successful Materials Management is the availability of a sound vendor base which is now rightly acknowledged as an extended arm of the business. One of main reasons of failure of many Supply Chains, in recent years, has been the inability to hold trusted vendors together.

Vendor management, therefore, requires careful planning and execution, over a fairly long period of time.

2.5.1 Vendor Registration

A **vendor** is literally a person or organization that vends or sells contingent labor. Specifically a vendor can be an independent consultant, a consulting company, or staffing company (who can also be called a supplier – because they supply the labor or expertise rather than selling it directly).

A **VOP** or Vendor on Premise its up shop on the client's premises. They are concerned with filling the labor needs and requirements of the client The VOP does this either by sourcing labor directly from themselves, or from other suppliers, whom may be their competitors. Also, the VOP manages and coordinates this labor for the client.

A **MSP**, or Managed Service Provider sure their effectiveness in requisitioned according to the client's standards and requirements. MSPs generally do not recruit directly, but try to find the best suppliers of vendors according to the client's requirements. This, in essence, makes the MSP more neutral than a VOP in finding talent because they themselves do not provide the labor.

VMS is a tool; specifically software distributes job requirements to staffing companies, recruiters, consulting companies, and other vendors (i.e. Independent consultants). It facilitates the interview and hires process, as well as labor time collection approval and payment.

For ensuring continuous supply of right quality materials required, at the optimum cost, it is essential to have a dependable, competent & competitive vendor base. The Limited Tender Enquiry (LTE) is issued only when reliable manufacturers/ suppliers/ traders/ contractors are known and for this purpose, there is a need to maintain a list of registered vendors. So, Vendors are empanelled for the supply of various categories/ subcategory of items

For this purpose, the vendors interested to supply the specific category/sub-category of items are asked to submit the application along with all the documents required to establish their financial & technical capability. The application forms so received are scrutinized and the vendor capacity assessment is carried out through inspection department / technical experts to establish the technical capability of the vendors. These vendors are listed as registered after following up certain processes.

2.5.2 Vendor development

Many process industries like to search the alternative and less costly material as substitution of the currently used costlier materials. The less the procurement cost the more is the profit.

Also, there may be situations where the existing suppliers may not be willing to supply the items on various grounds, thus, necessitating, looking into different alternatives

An efficient Materials Manager would devote enough time to develop substitutes & sources of supply with a view to reduce cost of input materials and also to have reliable alternative source for foreign sources.

Normally, in large manufacturing organizations, a Vendor Development cell (VDC) remains engaged all through for the purpose. When the need to develop a Vendor for an item is felt the requisition for such items is made by concerned department indicating the trial quantity and the potential vendors. Trial Orders are placed on potential vendors and also necessary help is rendered to them to come up to the desired level.

2.5.3 Vendor Rating

The vendors also like to be given priority be the purchaser if it constantly improves its selling performance which from a purchaser point of view is mainly its offered price, quality and punctuality in delivery.

For Purchaser, there shall always be a need to continuously monitor and update its registered vendor base so that the organisation continues to have the most competent & competitive vendors in its list of vendors. For this purpose the efforts are made to monitor supply performance of the vendors and rate them objectively. The major factors usually considered for such vendor rating are competitiveness of vendor (price), quality of supply and delivery adherence.

Vendor rating may also be used for removing a vendor from registered vendor list and also in the

Selection of vendors while issuing Limited Tender Enquiry

2.5.4 Vendor Exploration

To have competitive & competent sources of supply, efforts are made to explore suitable vendors from various sources like internet websites, international bulletins, vendors list of other similar manufacturing organizations etc. This is known as vendor exploration and in the competitive environment it is taken as a serious activity.

In 1993, one such company recognized the contingent labor spend management niche as an immense opportunity – Geometric Results Inc. (GRI). At its origin, GRI was a wholly owned Ford Motor Company was GRI who developed one of the first significant VMS applications in the industry, People Net. Originally starting out as a manual process, some system automation was introduced in 1995. A year later, People Net became an automated VMS system. Overall, GRI managed nearly $200 million in spend at Ford. In 1997, MSX

International purchased GRI and continued its growth in the marketplace offering a vendor neutral solution to its clients within the automotive industry

Stores Management

Structure

3.1 Introduction

- 3.1.1 Types of stores
- 3.1.2 Store Management

3.2 Stores' Systems and Procedures

- 3.2.1 Material Status art Receiving
- 3.2.2 Step wise Receiving Process
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- 3.3.1 Need for Inspection
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3.4 Radio Frequency Identification (RFID) Technology

- 3.4.1 Tag or Ransponders
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- 3.4.3 Advantages of RFID

3.1 INTRODUCTION

Stores ....Where materials are managed

The very essence of Materials Management gathers its relevance from Stores, a place that keeps the materials in a way that the materials are well accounted for and are maintained safe.

A typical Store has a process and a space within, to receive the incoming materials (Receiving Bay), keep them for as long as they are required for use (Custody) and then to move them out of stores for use (Issue). In a manufacturing firm this process forms a cycle to maintain and run the activities of Stores.

The basic responsibilities of stores are to act as custodian and controlling agent for parts, supplies, and materials, and to provide service to users of those goods. Well-designed systems provide flexibility to absorb the shock demand variation, and enable purchasing to plan ahead, practice forward buying, and so forth.

3.1.1 Types of Stores

A) Closed stores – Closed systems are utilized when close control and accounting for inventories are desirable. In such cases, storage areas are kept locked and entry is limited to stores employees or to others only on an authorized basis. Goods enter inventory through a formal receiving process and leave through an authorized requisition or bill of materials. Closed systems typically include industrial or business stores operations, and involve

repair parts, consumables, tools, and materials or components for assembly where ongoing control and accuracy is essential

(B) Open stores – There are instances where the cost of closely controlling inventories outweighs expected losses in an uncontrolled environment. In such cases, inventory storage areas may be left open or kept close to the point of use for efficient user access. Such inventories are available for use as needed, with emphasis on expediting production, or operations rather than on security.

(C) Random Stores: - In random access systems, goods are stored without regard for commodity groupings. Instead, goods are stored in the next or nearest available space of suitable size. However, it is good planning to select from available storage spaces with consideration for the anticipated frequency of issue. Locating items in random access storage usually requires a computerized system. Random access systems tend to be used in conjunction with a closed stores system

(D) Automated warehouse – A large variety of automatic storage and retrieval systems (ASRS) are being used today. ASRS systems have the capability of bringing goods from storage or placing goods into storage upon computer entry of the item identification and/or storage location. Such systems may

range in size from small rooms to whole warehouses, and may handle items ranging form small parts in tote pans to large materials on pallets.

(E) Contractor operated system, Or integrated supplier systems – Where business volume is sufficiently large, suppliers may operate a firm's Supply or inventory storage facility using supplier personnel, under contract with the using organization. Depending on the agreement, a contractor may either acquire on-site inventories or just manage them.

In some cases, supply contractors have branches built next door to industrial plants, for the sole purpose of supplying all needs of the plant. In some cases, the two facilities are separated by a common wall and supplies are issued through an opening in the wall. This is an emerging trend for MRO and office supply goods.

3.1.2 Stores Management

A professionally managed Store has a process and a space within, to receive the incoming materials (Receiving Bay), keep them for as long as they are not required for use (Custody) and then to move them out of stores for use (Issue). In a manufacturing firm this process forms a cycle to maintain and run the activities of Stores. **The basic responsibilities** of stores are to act as custodian and controlling agent for parts, supplies, and materials, and to provide service seers of those goods.

- Of incoming consignments (goods)
- Safe keeping of goods (Custody)
- Disposal of undesirable goods
- Inventory Management
- House keeping and record maintenance

It all starts with a suitable lay out design of stores. Depending upon the nature of items used for processing by the organization the lay out and type of stores are selected. For example, a process that requires use of raw materials, not costly enough, an open and nearby stores with truck / rail inside movement possibility can be adequate. Similarly, for storing costly material, a closed and restricted type of stores shall be needed. However, irrespective of the type and lay out, any Stores would have, as its starting activity, receiving and accounting of the incoming goods. This part of Stores is known as

Receiving Bay.

Once the material has been received and cleared through inspection and accepted for use, it needs safe custody till it's actually used. It calls for a separate physical storage space, open or closed, as per need. It maintains all documents that are able to trace an item, show all its details and preserve it up to its shelf life in the manner prescribed or till it is issued for use. This part of Stores is called **Custody**. Thus the role of Custody is to receive and preserve the material and then to issue it to the user, as and when needed. Of the custody again

A stage comes when the material is needed for use. Stores thus release the material from its custody to the user department and the process is called 'issue of goods. It might also happen that after partial use, some materials having useable value in future are returned to the stores and thus they also become part

In the long drawn process of preserving the materials till its use, some materials might get obsolete and unserviceable and may require removal from stores, in order to clear space for other incoming goods. This activity is known as **Disposal of goods** for which auction etc is done.

Since the material has a cost, the organisation would definitely like to incur optimum cost on this account and thus there is a need to manage the materials within stores such that the total cost of maintaining materials remains optimum. The materials, lying unused but have future economic value are said to form inventory which needs professional handling. **Inventory control / management** thus is a vitally important aspect of any stores function. One of the basic functions of stores is **to account for every material** received in Stores by maintaining proper records of all the incoming, stored and outgoing materials so that proper accounting and audit trail is maintained. Hence, record keeping is a vital function of stores. Of course, it also goes along the various activities and with development in the information technology domain, the record keeping in stores too is through electronic medium making the whole process smooth and efficient.

Any Stores as such is a physical entity which deals with material receipt, preservation and issue. **Material handling** therefore is another vital function. Just as Lay out of a Stores is designed considering the nature of material Stores has to handle, material movement equipment and implements also are important. Within a typical manufacturing organisation, its Stores is seen having **Forklifts, Over head Cranes, Trolleys** etc inside the Stores and trucks, Dumpers and Railway wagons as outside Stores equipment to handle materials.

3.2 STORES' SYSTEMS AND PROCEDURES

To have effective control and proper accounting of materials, a professionally managed Stores has the following main functions:

- **Receiving**
- **Custody**
- **Inventory Control**
- **Disposal**
- **Receiving**

3.2.1 Materials Status at Receiving

Materials in the Receiving department are segregated into several categories, based on their quality control status and destination. Procedures in receiving must provide for storage and transport of material in each category. The major categories of materials are:

Awaiting inspection – This category consists of material that has been received and is awaiting inspection before being moved into stock.

Acceptance upon certification – This category consists of material that may be accepted pending certification.

Rework: In this category are materials that are defective and must be reworked.

Return – This category contains materials that are defective and will be returned to the supplier for credit or replacement.

Materials to be tested – This category consists of materials which have been received and are awaiting delivery to the using/testing department.

3.2.2 STEP WISE RECEIVING PROCESS

Open Purchase Order wise file, once P.O. is received. Maintain Railway Receipt Register, Consignment Note Register, Inspection Request Register, Rejection Register and other relevant documents viz. individual P.O. wise file, advance document file, shipping documents, Guarantee Certificate and inspection certificate, challan etc. and to feed the relevant data into the computer.

Receiving reports/documentation – Receiving keeps records of all deliveries, and notifies the involved parties, including accounts payable, purchasing, and the end users. If the operating systems for the business are computerized, then data for each receipt is entered into the system, and linkage to the purchase order and accounts payable files can occur automatically. Reports of receiving activity can be generated as needed. Manual documentation may also be kept. Normally, even in a computerized business, copies of the bills of lading and the packing slips are retained in the receiving files

Receive/collect material, make cash payment towards freight and demurrage including transportation charges.

Unloading, checking of quantity (checking the shipment) :

The process for receipt of a shipment includes unloading the shipment from the delivery vehicle, verifying the shipment with the delivery, and signing the carrier's bill of lading. Number discrepancy should be detected at this stage, where the quantity reflected on the bill of lading is not what is delivered. These should be detected and reconciled before the driver leaves. Once the bill of lading is signed, count errors are much more difficult to resolve.

Unpacking / opening of packages and inspecting:

The next step in the process is to check the open order file to verify that receipt is a legitimate one, and to verify the quantity due. Feed data like D.B., P.O, and challan etc. in computer and generate the goods received intimation/inspection certificate for sending it to the indentors / users

If a shipment is found to be incomplete, it should be so noted by recording the amount actually received. This action will reflect a partial receipt of the P.O. quantity, and leave the line item open for receipt of the balance. If there is no internal documentation for the material received, it is classified as pending or "in suspense" until its status is resolved.

Material received may be unpacked and inspected either in receiving or by the using department. The same procedures for reporting and managing damaged apply in either case. Obvious damage will probably be detected in the receiving department. Concealed damaged is usually detected when the container is unpacked.

Lodging of Claim for Discrepancy:

As soon as damage is detected, the carrier should be notified and a claim for recovery filed. The carrier must be promptly notified of the damage; agents of the carrier have the right to inspect the damaged goods. This means that as soon as the damage is discovered, the material must immediately be set aside and not disturbed. The carrier's agents will want to inspect not only the damaged goods, but also the packing and the box in order to determine the cause of the damaged. Photographic proof showing the damage is a good safety measure, especially if the goods are perishable. Lodge preliminary claim for any discrepancy such as non-receipt, partial receipt, damaged and missing items.

Procedure for the return of goods to suppliers:

If goods are received and rejected, they are normally set aside in a segregated area until disposition is arranged. If the goods are to be returned to the supplier, procedures for shipment should include reopening the purchase order for that quantity of material, and arranging for the collection of freight charges from the supplier. Arrange packing, forwarding & dispatch of rejected consignment back to the party. Obtain short/damage certificate from carriers and forward the same to claim section of Finance for on-ward transmission to underwriters.

Follow-up and do necessary chase-up with the carriers, underwriters, suppliers for quick clearance of cases pending with them.

The F.O.B. point on the purchase order determines who will pursue the damage claim with the carrier. If the goods are purchased F.O.B. Origin, the buyer's organization owns the goods in transit and must pursue the damage claim. If the goods are F.O.B. Destination, the supplier owns the goods in transit, is obliged to pursue the damage claim, and owes the buyer immediate replacement of the goods, since the purchase order is not fulfilled. At the end, once the goods are accepted on inspection generate the necessary document (Goods Received Note) for the good accepted and update the record accordingly.

Handover the material to the Custody Section / Indenter whichever is applicable

3.2.3 Receiving Systems

In a computerized environment, the use of bar coding to complete the receiving transaction makes the process simpler. Suppliers affix a bar code label to the packages which is electronically read at the receiving dock, and this action automatically updates the computerized system with all the information contained in the bar code.

Issue regarding the separation / integration of Purchasing and Receiving:

Auditors examine the roles of purchasing, receiving and accounts payable to verify separation of the functions. Independent verification of material receipts is considered one means of protection against internal fraud, since it becomes more difficult to falsify records or steal merchandise if several people are involved in the series of transactions.

However, it is necessary for purchasing and receiving to work closely together. Purchasing manages suppliers, and both buyers and suppliers are measured on delivery performance. Suspending a delivery or creating a backlog of work so that receipts are not entered promptly, can create delivery performance information that is not reflective of a supplier's true performance.

Procedures for Receipt, Inspection and Acceptance of Service Purchases:

The receipt of services is normally not done by the receiving department but by the end user. Formal notification of "receipt" must be given so that the accounting function is authorized to pay the invoice, and so the Supplier understands that the customer considers the service complete. Contracts for a service should be accompanied by a clear set of instructions and acceptance criteria, so both the supplier and the customer have the same understanding of what completion entails. When the supplier believes the work is finished, the customer normally inspects it and either agrees or disagrees. When both agree, then the customer creates a receiving transaction that closes the order and authorizes payment. All end users should have a formal procedure for accepting and receiving a service so that consistency is maintained.

3.3 Incoming Materials Control

Any organization, big or small, shall look for quality input (materials) from suppliers to have the desired output or use. For this reason, it devises ways to control the incoming materials by having a check system on quantity , quality and readiness for use. Control on incoming materials is exercised through Inspection by the purchaser.

3.3.1 Need For Inspection

Inspection is an important aspect of Integrated Materials Management. It is an adjunct to the purchase function to ensure that the incoming materials of right quality are procured for use.

The word quality has numerous meanings. The most appropriate meaning of quality in the present context is "CONFORMANCE TO ORDERED SPECIFICATION & FITNESS FOR USE", whether for products or services.

Depending upon the nature, criticality & value of items, inspection is conducted either at supplier's premises or at plant stores after receipt there are several ways of carrying out inspection.

3.3.2 Pre Dispatch Inspection

This is inspection before dispatch of material. Usually specified in the Purchase Order (PO) , the inspection is carried out at supplier's premises (works). Supplier gives an Inspection Request (IR) to the inspection agency mentioned in the PO. On receipt of IR, the inspecting officer visits the supplier's premises along with documents necessary for inspecting such as copy of PO, drawing, specification etc.

The following checks are conducted depending on the nature of item:

- Visual check
- Dimensional check
- Functional check
- Physical testing such as hardness, pressure test, load test etc
- Electrical and other on-bed testing such as High voltage test, Insulation resistance test etc.

3.3.3 Final Inspection

For critical items, it is required to conduct stage inspection of semi-finished items (such as castings, forgings etc) at suppliers premises. In such cases, the supplier gives an interim Inspection Request to the inspection agency. During stage inspection, sample is collected by the inspecting officer for Chemical analysis / Physical testing at either their own facility or at 3rd party locations. On receipt of test results, conformance to specification is verified & clearance is given to the supplier for further processing of the item. After readiness of the material in all respect & internal checking, the supplier gives the final Inspection Request to the inspection agency. In some critical cases, joint inspection by Indenter & Inspection is carried out at supplier's premises.

3.3.4 Document Inspection

Sometimes and usually for very standard ,off the shelf items, inspection can be carried out through the verification of supplier given certificates such as Material Test Certificate (MTC), Manufacturing Certificate (Mfg. TC), Guarantee Certificate (GC) etc. After ensuring conformance of materials to the ordered specification in all respect, Inspection Certificate (IC) is issued by the inspecting officer to the supplier.

3.3.5 Receipt Inspection

Majority of items are inspected through this route. Materials are received in the receiving bays of Stores. Such items are usually accepted based on visual examination & verification of documents. Materials in the receiving bay are segregated into several categories, based on their quality control status and destination. Procedures in receiving provide for storage and transport of material in each category.

The major categories are:

- Awaiting inspection – This category consists of material that has been received and is awaiting inspection before being moved into stock.
- Acceptance upon certification – This category consists of material that may be accepted pending certification.
- Rework – In this category are materials that are defective and must be reworked.
- Return – This category contains materials that are defective and will be returned to the supplier for credit or replacement.

Materials to be tested – This category consist of materials which have been received and are awaiting delivery to the using/testing department.

3.3.6 Party Inspection

In case of specialized items, which require special proficiency for inspection, help of third party inspection agencies is taken.

Statutory Compliances (IBR, EXPLOSIVE):

In case of items, which require approval of statutory authority such as IBR (Indian Boiler Regulation), CCE (Chief Controller of Explosives) etc, verification & correlation of documents with the materials is done by the inspection agency before acceptance.

3.3.7 Quality Complaint Redressal

If materials after issue to the user department are found to be having defects such as dimensional deviation, fitness problem etc, the supplier is asked to supply free replacement against such defects. If there is a pre-mature failure of the material, joint investigation is carried out by the indenter & inspection agency. If it is established that, the pre-mature failure has occurred due to use of wrong material or faulty workmanship, the supplier is asked to either rectify the defects (if feasible) or supply free replacement.

3.4 RADIO FREQUENCY IDENTIFICATION (RFID) TECHNOLOGY

RFID is a type of auto ID technology that uses radio waves (as the name Radio Frequency Identification denotes) to identify, monitor and manage individual objects as they move between physical locations. So, RFID is a smart sensing technology. The RFID Technology has been compared with the existing and well-established competing Bar-coding Technology.

Radio Frequency Identification (RFID) is enabling companies to see further into the supply chain than ever before, providing more accurate real-time information and improvements in process efficiency. The increased visibility can result in faster inventory turns, less shrinkage, reduced labor and higher material flow through your warehouse or distribution center. Greater efficiency means RFID enabled processes take less time and effort; entire pallets of product can be recognized in seconds without the

need to break them down, and cycle counting inventory can be accomplished in hours or even minutes instead of days.

Components of RFID: There are two major devices supported by the interfacing software.

RFID Tag: It is a very small device having a chip that holds stored digital information and antenna that communicates with the receiver.

RFID Reader: It is a comparatively larger device that communicates with RFID tags to check the stored data. When the RFID reader excites the tag using radio waves, the tag responds by transmitting the code that is stored inside it.

How does RFID Technology work?

For utilizing RFID technology, it is obvious that one has to tag all the concerned items, pallets or cases. This is also known as "e-tagging". When these tagged objects pass through reader or scanner, data recorder on the tag is captured and scored in the computer. No line of sight is required for reading the data. Various combinations of these tags & readers can be availed in multiple situations. This leads 10 reductions of Labour costs; more efficient business processes and improves connections with business partners like suppliers. RFID devices and software are also to be supported by an advanced software architecture that enables the collection and distribution of location based information in real-time.

3.4.1 Tags or Ransponders

RFID tags are barcodes having electronically programmed unique information. A finished tag encapsulates all the information and the small chip and the antenna mounted on it.

The tags can be applied to containers, pallets, cases or individual items. Tags can be classified based on three criteria: Power Source, Frequency and Encoding Method. Depending upon the applications and environment, RFID tags have different range of durability. Paper-thin tags referred as "Smart Labels" can be used for disposable applications also. On these tags special Radio Frequency enabled printing is done.

3.4.2 Bar-coding V/s RFID

Bar coding is the currently adopted technology. It seems that RFID and Bar coding are competing technologies. But, in fact, both the technologies are complementary to each other. It is more economical to replace the barcodes on every item with RFID tag. To start with, both the technologies can be used simultaneously and gradually the whole infrastructure for RFID can be developed. The reason for advocating the usage of RFID is the significant advantage provided by it over and above the bar coding. Barcodes must be scanned at specific orientation to establish line of sight. But RFID does not require it. RFID tags need only to be in the range of reader to be read or scanned.

Barcode technology doesn't work if label is damaged while RFID tags can withstand chemical and heat environment. RFID tags have read and write capabilities and can be up dated while barcodes contain static information that can be updated by reprinting the code.

RFID tags can potentially contain a great amount of data compared to barcodes. RFID tags do not require any human intervention for data transmission whereas barcodes do.

3.4.3 Advantages of RFID

The advantages to various stakeholders are as under

Greater supply chain visibility through real-time monitoring of virtually any resource Reductions in stock-outs, required inventory levels and unnecessary reorders. Automatic data harvesting to provide a foundation for more accurate forecasts, trend analysis and demand planning Quicker reaction times to sudden fluctuations in inventory levels Capabilities to keep a full audit train on each tag, and therefore each item or container Ability to read multiple tags simultaneously through a variety of materials lets you perform non- invasive quality control instantly Sharing EPC information quickly with a vast number of partners helps keep your efforts coordinated and accurate

Benefits of RFID:

- Get information more than that given on packing
- Relaxation from waiting in queue at checkouts
- Hassle-free shopping by Interactive shelves and easy accessibility
- Quicker response to requests made
- Items can be located conveniently
- Saves time

Benefit to Retailers:

- Helps in inventory tracking without line of sight with much more accuracy
- Provide support in excellent customer service
- Makes environment of store more secure and 40-50% reduction in losses due to theft
- With RFID tags no hand counting or individual scanning is required which saves the labor and the time taken to locate each bar-coded , label and scan it

To Manufacturers:

- Improved demand planning and forecasting
- Faster cash to cash cycle-from raw material purchases to payment for finished goods-to reduce working capital requirements
- Stricter quality control resulting in improved product quality
- Improved vendor managed inventory and consignment management
- Tracking and identifying gray market goods and counter felts

Though initially it seems that RFID technology is expensive, but if the entire gamut of supply chain is taken into consideration, it turns out to be cheaper and operationally efficient. This technology can be extensively used in the following domains of business

- Retail, Supply Chain Management and Warehouse Management
- Logistics, Tracking of goods and trucks
- Shipping, Container Tracking, Cargo Tracking
- EPC Industry for all Materials Management operations
  Animal Tracking
- Toll Plaza for collection of toll taxes etc
- Hospitals particularly for infant tracking or patient tracking
  Security systems for cars etc

While exporters are concerned about RFID, domestic IT companies are all set to tap it to boost their bottom lines. According to Frost & Sullivan, the market for RFID hardware, software, and services will exceed $ 5 billion in 2007. According to another industry projection, one trillion RFID tags will be required by 2012.

Inventory Control

Structure

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4.1 OVERVIEW

Inventory management or control refers to the management of idle resources which have economic value tomorrow. Alternatively, Inventory may be defined as usable but idle resources that have economic value.

Inventory Management refers to maintaining, for a given financial investment, an adequate supply of something to meet an expected demand pattern. It thus deals with determination of **optimal policies and procedures** for procurement

In business management, inventory consists of a list of goods and materials held or available in stock. Management of inventory or Inventory management is all about handling functions related to the tracking and management of material. This includes the monitoring of material moved into and out of stockroom locations and reconciling the inventory balances, setting targets, providing replenishment techniques, reporting actual and projected inventory status.

The **task of ABC analysis**, lot tracking, cycle counting support etc. can even be a part of inventory management.

- **Inventory control is** concerned with minimizing the total cost of inventory. The three main factors in inventory control decision making process are:
- **The cost of** holding the stock (e.g., based on the interest rate). The cost of placing an order (e.g., for row material stocks) or the set-up cost of production. The cost of shortage, i.e., what is lost if the stock is insufficient to meet all demand.

The third element is the most difficult to measure and is often handled by establishing a "service level" policy, e. g, certain percentage of demand will be met from stock without delay.

Terminology used in Inventory management / control:

Maximum Limit: When devising a suitable Inventory model, the Maximum limit establishes the upper limit to which the stock of an inventory item shall be allowed.

Minimum Limit: It is the lower limit to which the stock can be allowed to fall in course of replenishment of the stock of an item. Normally, this is taken to be the safety stock also.

Safety Stock: This is the stock that is maintained to counter the variation in demand of an item during the replenishment lead time.

Demand or Usage: Replenishment of stock and usage of an item is an ongoing phenomenon in inventory control. Demand thus is the rate of usage of an item. Over a period of time demand is considered to be stable. However, demand can be seasonal or cyclical in nature depending upon an item's nature.

Inventory Overview:

Inventory refers to those idle resources which have economic value and thus it may be defined as usable but idle resources that have economic value.

Inventory is a stock of direct or indirect material, from raw material to finished goods stocked in order to meet an unexpected future demand.

In other words inventory is a physical stock of goods kept for the future purposes.

Inventory Management or control refers to maintaining, for a given financial investment, an adequate supply of something to meet an expected demand pattern. It thus deals with determination of optimal policies and procedures for procurement.

Inventory is expressed in terms of both quantity and monetary value. In terms of quantity , it can be expressed as the number of units of an item lying where as in monetary terms it is the sum total of the monetary value of all its items.

Functions of Inventory:

Though Inventory is a blocked capital, in the sense that it is not being used in the present, it plays a distinct role in the life of any organization for a smooth and efficient running of business For example, if a firm does not have any inventory then as soon as it receives a supply order it will look for raw material to manufacture the items and thus the customers shall be kept waiting. It alone may cost the firm its customers who may not like to wait. Further, all the internal agencies shall have to work in emergency for getting the material, completing the production etc. if there is no inventory. Inventories decouple individual phases of the total operation.

Thus the functions of inventory are to:

- Protect against unpredictable fluctuations in demand and supply
- Take the advantage of price discounts through bulk purchases
- Take the advantage of batches and longer production run
- Provide flexibility to allow changes in production plans in view of changes in demands etc.
- Facilitate intermittent production

Why Inventory goes up or down?

There are several reasons, the most important for a high inventory being a High Lead time
Tendency to play safe Stock outs and shortages lead to criticism
Standardization and variety reduction not given emphasis
Uncertainty / scarcity of items triggering over stocking
The basic function of inventory is thus to insulate the production process from changes in the environment. It decouples various interlinked functions and thus enables each function to conduct itself independently like Purchasing, Production, and Marketing etc.

Why Inventory needs to be optimally used?

Inventory is Blocked money, the working capital. It has a cost (approx. 20% of Average inventory)

Opportunity cost of investment funds: Investment in external securities / Equipments can earn a return for the company

Insurance cost: Inventory is an asset needing insurance

Storage costs: Cost is associated just for storing an item. When large number of items are stored the following also become costs that can not be ignored :

Obsolescence and deterioration Damage, pilferage or obsolescence

4.1.1 Inventory Management / Control basics

Inventory management or control refers to the management of idle resources which have economic value tomorrow. Alternatively, Inventory may be defined as usable but idle resources that have economic value.

What is Average Inventory Level?

The ideal inventory level is a material's Economic Order Quantity (EOQ). This is the amount ordered when an order is placed. Next you need to determine your Safety Stock (SS). This is the amount that you should have remaining when the EOQ arrives.

Basically, Safety stock is the average bare minimum you will have at any give time, and EOQ+SS is the average maximum amount you will have at any given point in time. This should be intuitive because safety is what you have when your shipment arrives and when the order arrives (EOQ) it gets added to the safety stock.

There can be average minimum and maximum because you might not receive the EOQ exactly when you planned to and therefore may have more or less. On average you should have the SS amount when you receive shipments. Between these two average minimum and maximum values lies your long-term average inventory.

The formula for this is:

Optimal Average Inventory = (EOQ+SS+SS)/2

This is for materials. For finished goods, you should aim to keep an inventory level designed to prevent a stock out. This level would be a safety stock of finished goods, thus making the ideal average inventory for finished the safety stock value based on your company's service level.

4.1.2 Assess Inventory Levels

Simplistic Method - Historical Inventory Levels

most methods of accounting take the beginning inventory of a period, add it to the ending inventory of a period, and divide by 2. This essentially provides the mathematical average for a given month.

For example, if your inventory level for a good is 2000 on July 1st, you produce 3000 units and sell 1000 units by July 31st. This leaves you with 4000 units. The formula is:

Avg. Inventory = (Beginning Inventory+(Beginning Inventory ++its Produced-Units Sold))/2

Avg. Inventory = (2000+(2000+3000-1000))/2 = 3000 Or more simply:

Avg. Inventory = (Beginning Inventory Ending Inventory)/2

Avg. Inventory=(2000+4000)/2=3000

So this covers historical looks using an accounting approach. A lot of firms use this method to evaluate their average inventory levels.

4.1.2 Daily Weighted Average Inventory Approach

Suppose you start with 10,000 units on May 1st. Also suppose you produce 10,000 units in that month spread out across 21 business days. Now (and this is the important part) suppose you sold 20,000 units in May. This brings the ending inventory to 0. Using accounting methods, the formula gives us 10,000 as the average inventory.

So why is this so bad? In short, because the average inventory is not 10,000 units. In fact, there were only two days in which 10,000 units or less were held and these days were May 1st (10,000 units) and May 31st (0 Units). Assuming that production was level through the 21 day working month, this means that 500 units were produced daily, thus raising inventory by 500 units a day until inventory was dropped by 20,000 on the 31st.

Thus weighted average is more suited than the simple average.

Why are inventory levels so important?

To put it simply, average inventory levels are important because they allow you to determine how much money you have tied up in inventory and how much value your inventory assets hold. Helping to determine what they should be can help cut back on unneeded inventory, and knowing what they are can help you determine average warehouse usage, inventory risk, percentage of assets that are made up inventory, holding costs, etc.

4.1.4 Optimization of Inventory

Optimization is probably the most overused word in management today. But what is optimization? The Concise Oxford Dictionary defines optimization as: "the most favorable condition; the best compromise between opposing tendencies; best or most favorable". Before exploring the implications of that definition let's go back and understand MRO inventory.

MRO inventory includes all the maintenance spares carried for responding to both breakdowns and scheduled maintenance, it covers all the operating supplies carried to keep the process running, it covers all the inventory held by OEMs (Original Equipment Manufacturers) to service the equipment they sell, it covers all the inventory held by suppliers that becomes your inventory (such as bearing suppliers). It is a very wide field.

For all types of inventory there are only three reasons why you purchase and hold onto inventory:

To enable supply in a timely manner. This means that when you need the part you need it faster than it can be supplied from your suppliers. You need the part and you need it now!

Project or shutdown work. With project work and shutdowns you have the uncertainty of what might be needed, perhaps the timing of when it might be needed and a workforce and timelines that can't wait. You must hold some inventory.

Purchasing and manufacturing efficiencies. Sometimes it is just not economic to buy spares on a piece-by-piece basis. Therefore you buy the minimum economic quantity and have a spares inventory investment.

But if this was all there was we would all hold only as much inventory as we really need right? Yes, that's right but this is not all there is! You see sometimes we end up holding excess inventory because

there have been changes since we last determined our appropriate holding (yes, we may have calculated the wrong inventory level in the first place but I'll let that go for now.)

Some of the changes you might experience that will change your inventory requirements include:

Improvements in reliability (note that carrying spares doesn't improve reliability it only reduces repair time but improved reliability results in reduced demand for spares) Changes in the criticality of the equipment due to market or technology changes in the capability of suppliers as they have improved their systems And this is where optimization comes in. Using the definition of optimization from the Concise Oxford Dictionary, typical optimization programs calculate the 'compromise between the opposing tendencies of cost and availability'. This is achieved by recalculating the required holding and safety stock. Sometimes, optimization is presented as identifying excess or potentially excess holdings through a review of slow moving stock.

Inventory Holding Costs:

The first section is going to discuss rough estimates and the second section will discuss methods involved with detailed holding cost analysis.

Rough Estimations:

Typically, holding costs are estimated to cost approximately 15-35% of the material's actual value per year.

The primary factors that drive this up include additional rent needed, great insurance premiums to protect inventory, opportunity costs, and the cost of capital to finance inventory.

A More Detailed Look at Holding Costs:

First of all, it is generally best to think of holding costs in terms of their annual costs. To do this, you will need accurate representations of your annual inventory levels. It is always better to track inventory month by month and using these values to find the average holding cost as opposed to taking the year's beginning, the year's end and averaging the two.

So now you have your average inventory. This needs to be performed for finished goods, work in process, and raw materials inventory.

Now, you need to figure out what percentage of the total value of the good is being incurred as a holding cost. Cost of capital and opportunity costs should be the first things you think of.

If you are financing the goods with a 10%/year loan then the holding costs are at least 10% annually. When you are evaluating the total value, include the value of any labor that has been added to the goods.

Next step would be to consider the cost of storage. Based on the inventory you need to carry, how much space do you need and how much does that space cost per unit as a percentage of each good.

Again, determine the insurance cost that should be allocated to each good as a percentage of that good.

Evaluate the probability that a good will rot, or otherwise become obsolete and assess the average rate at which this occurs and use this to quantify the average holding cost per good as a percentage of that good on an annual basis.

Determine if there are any other costs you can think of that are incurred simply by being in possession of a good. If you can think of any, treat them as holding costs. Add up all of these percentages and together they make your holding costs.

4.2 ECONOMIC ORDER QUANTITY(EOQ)

EOQ is a mathematical formula designed to minimize the combination of annual holding costs and ordering costs. There is a lot of hype about just in time inventory systems (JIT), which achieve smaller inventories through very frequent orders, but frequent ordering can often result in an over-spending on ordering costs. Even though companies often miscalculate their ordering costs, which makes frequent ordering seem costly, EOQ is an important tool for determining what inventory should be?

Safety Stock

First of all, here's the formula so you don't have to dig through my well-written article for it.

Safety Stock: {Z*SQRT (Avg. Lead Time*Standard Deviation of Demand^2 + Avg. Demand^2*Standard Deviation of Lead Time^2}.

4.2.1 Basics of Production Inventory Management

Production inventory management differs from general warehouse management because it involves the determination of how quickly to produce a particular product. The factors involved in many cases are similar, though there are some variances in making the final decision as to how quickly manufacturing should push items through the production line.

Available Materials

Of course, the first concern in production inventory management is on the front end of the process. If you don't have the materials required for production, then you can't move forward in providing the products to others. You must make certain that you have all the supplies you need, from raw materials to factory workers, to complete the production process.

Supply and Demand

you must determine the current demand for the product on the market.

Good production inventory management occurs when you produce just enough material to satisfy customers' needs without overextending the production line and manufacturing too many of any given product

You don't want an incredible amount of back stock lying around, as this detracts from your net profit.

On the other hand, you don't want to be in short supply when a large order comes in, so having a little extra on hand is a great idea, and making sure you are prepared to make a production run for such orders is vital.

Quality Control

Never simply assume that everything manufactured will be flawless. An important consideration in production inventory management is to allow room for error. In other words, calculate a sufficient

amount of product to assume that, even with flaws that get past quality control efforts, there is sufficient stock of the product required.

Cost Analysis

In many instances, even the best production inventory management strategies fail in the long run due to the cost of the production process being overlooked as a factor. It is important to maintain a cost effective production process, and this includes making sure that your inventory is not an overwhelming factor. This comes back to not MR Producing any items that come off the assembly lines. Doing so is a waste of time and materials, costing you excess money to create.

Obviously, conservation of the materials, time, and energy consumed in manufacturing unnecessary goods is essential to maintaining a cost effective production inventory management strategy. Be proactive in keeping close watch on all occurrences in your production or manufacturing facility to make sure that there is no waste, and you are guaranteed to achieve a greater standard of success and profitability.

Inventory Classifications:

Inventory is idle resources that have future economic value. It indicates that it may be available in different forms depending upon the production cycle stage it is in. Classification of inventory is done on this basis and thus the different classifications of inventory are as follows:

Raw materials - Raw materials are input goods intended for combination and/or conversion through the manufacturing process into semi-finished or finished goods. They change their form and become part of the finished product.

Components and Parts - Just as raw materials are converted to finished goods in a manufacturing operation, components and parts are assembled into finished goods in an assembly operation.

Maintenance, repair and operating inventories (**MRO**) - These include parts, supplies, and materials used in or consumed by routine maintenance and repair of operating equipment, or in support of operations.

In-process goods - These are goods in the process of manufacturing and only partially completed.

They are usually measured for accounting purposes in between significant conversion phases. In-process inventories provide the flexibility necessary to deal with variations in demand between different phases of manufacturing.

Finished goods - These represent the completed conversion of raw materials into the final product. They are goods ready for sale and shipment.

Resale goods - These are goods acquired for resale. Such goods may be purchased by a wholesaler for resale to distributors, or by distributors for resale to consumers, etc.

Capital goods - These are items (such as equipment) that are not used up or consumed during a single. operating period, but have extended useful lives and must be expensed over multiple operating periods. Tax laws require that such an item be capitalized, and a predetermined percentage of its cost be recognized as an expense each operating period, over a predetermined time frame, according to equipment classes.

Construction materials - These are raw materials and components for construction projects such as a building, bridge, etc.

Hard goods/soft goods - What one identifies as hard goods and soft goods will vary depending on the industry involved. For example, in data processing, hard goods include apparatus such as computers and terminals, while soft goods include software, data storage media, and the like.

Inventory control is concerned with minimizing the total cost of inventory. In the U.K. the term often used is stock control. The three main factors in inventory control decision making process are:

The cost of holding the stock (e.g., based on the interest rate).
The cost of placing an order (e.g., for row material stocks) or the set-up cost of production.
The cost of shortage, i.e., what is lost if the stock is insufficient to meet all demand.
The third element is the most difficult to measure and is often handled by establishing a "service level" policy, e. g, certain percentage of demand will be met from stock without delay.

The ABC Classification the ABC classification system is to grouping items according to annual sales volume, in an attempt to identify the small number of items that will account for most of the sales volume and that are the most important ones to control for effective inventory management.

Reorder Point: The inventory level R in which an order is placed where R = D.L, D = demand rate (demand rate period (day, week, etc), and L = lead time.

Safety Stock: Remaining inventory between the times that an order is placed and when new stock is received. If there are not enough inventories then a shortage may occur.

Safety stock is a hedge against running out of inventory. It is an extra inventory to take care on unexpected events. It is often called buffer stock. The absence of inventory is called a shortage.

Quantity Discount Model Calculation Steps:

Compute EOQ for each quantity discount price.
Is computed EOQ in the discount range?
If not, use lowest cost quantity in the discount range.
Compute Total Cost for EOQ or lowest cost quantity in discount range.
Select quantity with the lowest Total Cost, including the cost of the items purchased.
The following This JavaScript compute the optimal values for the decision variables based on currently available information about the above factors.

Enter the needed information, and then click the Calculate button.

In entering your data to move from cell to cell in the data-matrix use the Tab key not arrow or enter keys.

MENU:

The Classical Model
Shortage Permitted Model
Production & Consumption Model
Production & Consumption with Shortage Model
EOQ with shortage & lead Model
The ABC Classification
Inventory Control & uncertain Demand

Inventory System valuation, terminology

Inventory Control Systems:

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In designing an inventory control system, we really provide answers to the three questions:

How often should the inventory status be determined ?

This is an internal check system to ascertain that timely action is being taken to replenish the stock

When should a replenishment order be placed?

This shows the actual action to be taken to replenish the stock.

How large should the replenishment order be?

A replenishment order should have a rational about its size**. The real problem is to** determine the inventory level at which money invested in inventory produces a higher rate of return than it would were it invested in some other phase of the business.

Designing Inventory control systems:

The Demand pattern (D) happens to be the soul of any Inventory control mechanism. Basically inventory control is an attempt to balance the consumption and replenishment of stock of an item in an optimum manner. Obviously, the Demand pattern (D) sets the tone for devising any control measure and therefore while designing inventory control systems the nature of demand pattern viz. independent or dependent needs to be determined first. The Control approaches differ on this differentiation.

Inventory control systems under Independent demand scenario :

Also called the **Order-point control systems,** Independent demand patterns for an item occur when future demand for it is not related to and is unaffected by its previous demand.

For example, in case of maintenance, repair, and operating supplies, a given item X may be used by many operating departments, and demand by each department may depend on many factors over which there can't be any control. Therefore, overall demand rates for the item X may vary unpredictably from

period to period. In such cases, inventory levels may include provision for safety stock, in addition to the the average demand rate, in order to prevent stock-out situation.

For inventories exhibiting independent demand pattern control is exercised based on predetermined order points. Such systems are so designed that whenever a predetermined point in inventory level or in time is reached action to re-order is taken.

There are two basic systems of managing or controlling Inventory under the independent demand pattern:

1) Cyclical ordering or Fixed period system (Time Based)

2)Order point or fixed order quantity system

1) Cyclical ordering or fixed period system (Time Based):

Fixed Period based systems (also called "cyclical systems") are designed so that each inventory item is reviewed and reorders are placed after a predetermined time interval (i.e. every 2 weeks, every 30 days, etc.).

Orders are placed for each item equal to the difference between current inventory level and a predetermined maximum. In cyclical systems, time between reorders is constant, but reorder quantity is variable.

Predetermined maximums are set with a consideration of order lead time. It involves scheduled periodic reviews of the Stock level of all inventory items as follows :

Fixed Schedules (calendar) for reviewing a group of items is drawn

Fixed Desired inventory level (DIL) of each item or group of items is calculated. In case stock level of an item is insufficient to sustain the production operation until the next scheduled review , order is placed to **replenish the stock to DIL**

Maintenance of perpetual inventory records

Procedure : First , all the inventory items are grouped in certain feasible categories or classes of items such as Pipes & Pipe fittings, Raw materials, Chemicals & Reagents, Oil and Lubricants etc.

Now, a calendar is drawn for all the classes so that depending upon the number of classes each class is reviewed for replenishment during certain specified time frame.

Besides, the DIL or MaxL for each group or individual item is fixed.

Depending upon the Review period, a class of items is reviewed w.e.f.. its Stock position, Production plan, any dues in quantity against any previous order.

The DIL or **MaxL= (RP+LT+SS) X D**

During review and based on the Lead time , if the present stock of an item or group of items is not expected to last the next production plan then action for replenishment is taken by raising the material procurement requisition.

The Order quantity is decided by **(MaxL- (Present stock + dues in)**

Suitability of the system :

For materials whose purchases can be planned months in advance

For materials which exhibit an irregular or seasonal usage pattern

For items with volatile prices

For group of items purchased from and shipped together by one supplier

Disadvantages of the system:

Compels periodic reviews of all items

Not effective to combat stock out situations

Actual ordering quantities may deviate from optimum quantity

Tends to peak the purchasing work load around the review dates

There is no automatic trigger for reorder before the review time in the event of increased usage, which generally leads to increased inventory levels as a means of stock out prevention

System does not permit effective use of economic order quantities

Order point or fixed order quantity system:

Order point system / Fixed Order quantity system of inventory control is based on the (Re)Order point and Order quantity factors rather than on the time factor. The inventory policy, in this system, is drawn, defining the following

Fixed Order point / Re-Order Level (ROL) for each item
Fixed Maximum, Minimum levels for each item
Fixed Quantity to be ordered

Often called Min-Max systems, these involve both a maximum inventory level and a minimum at which reorders are generated. Basically, units of an item are issued until the level of that inventory reaches the predefined reorder point. An order is then triggered for a predetermined quantity (usually a calculated economic order quantity). In this system, the order quantity is constant and the time between orders s variable.

The different Inventory points (Levels) of stock for an item are :

Maximum level (Max.) , predetermined

Minimum Level (Safety stock, SS), predetermined

Lead time (LT) , predetermined

Monthly demand = D (often based on Moving average method)

MaxL.= (Review period + LT + SS) X D

Reorder level (ROL) = (LT + SS) X D

Order Quantity (OQ) = Max. – (Present stock + Pipeline dues)

Process: In course of consumption of an Inventory item , say, in the form of issue from Stores to the users, the stock level of the item starts depleting through its usage rate D.

As per the above definition, the stock goes up to the maximum level in the first replenishment and then, because of steady consumption, comes gradually down. In that process ,again as per the definition , it touches the ROL. As soon as the stock level touches the ROL fresh replenishment action is initiated.

It is presumed that the next lot shall arrive by the time the present depleting stock touches the Safety stock , keeping a stable Lead time and a stable usage rate D.

In some places the Order quantity is decided by the above formula whereas in some other places it is determined by the Economic Order Quantity (EOQ) concept. That's whenever an order is to be placed the quantity shall be EOQ.

Advantages:

Each item is procured in the most economical quantity An item is attended to only when it needs attention i.e. when its stock has reached the ROL Control can be exercised on Inventory w.e.f.. Max & Min levels

Applicability of Order Point system

Item must have a reasonable stable usage

Lead time should not have radical variation

Supplier should be able to accept irregularly timed and unscheduled orders

Limitations of the system:

Needs continuous monitoring of stock level of each item
Cumbersome to operate for items with unstable usage and lead time
perpetual inventory records are required.

Inventory control systems under Dependent demand scenario :

Dependent demand occurs when the need for parts, supplies, or materials is dependent upon a predetermined usage or production schedule.

In such cases, a description and quantity of components needed and the exact date of each need is defined by a production schedule

Required delivery dates for each component will then be offset by lead time, and orders will be placed accordingly. For example, if a pen manufacturing company plans to produce 1000 nos. of a given pen model in a period, it will need 1000 nibs, 1000 caps, etc., and will need them at the rate they will be installed in the finished pens.

Such needs, with consideration for lead time, are considered in a dependent demand planned order schedule.

Material Requirement Planning is one example of a system specifically designed to manage dependent demand reorders.

Role of EQO Basic Inventory Models (Economic Order Quantity / EOQ Models)

Economic Order Quantity (EOQ) models are the most basic models of inventory management. The approach in EOW models is essentially to trade-off various relevant costs and derives an order quantity and time for placing an order such, that the total costs are minimized. This note discusses the basic

EOQ model and the sensitivity of costs in EOQ model to various parameters. Later an extension of basic EOQ model is discussed in which case back-orders or shortage are allowed.

Functions of inventory

Though inventory is an idle resource, it is almost essential to keep some inventory in order to promote smooth and efficient running of business.

Consider the case – an enterprise that does not have any inventory. Clearly, as soon as the enterprise receives a sales order, it will have to order for raw materials to complete the order. This will keep the customers waiting. It is quite possible that sales may be lost. Also the enterprise may have to pay high price for some other reasons. On the other hand, inventory may promote sales by reducing customers waiting time. It is essential to maintain the inventories in order to enhance stability of production and employment levels. Consider the case of seasonal items. Any fluctuation in demand can be met if possible, by either changing that part of production or with inventories. However, if the fluctuation.is not by changing the rate of production, one has to take into account the following cost.

Cost of increasing production and employment

(i) Employment and training

(ii) Additional staff and service activities

(iii) Added shifts

(iv) Overtime costs

Cost of decreasing production and employment

(i) Employee compensation

(ii) other employee costs

(iii) Staff, clerical and service activities

(iv) Total time costs

In other words, the use of seasonal inventories can often ... after balance of these costs. Broadly, some other functions of inventories are to :

(i) protect against unpredictable variations (fluctuations) in demand and supply

(ii) take the advantage of price discounts by bulk purchases

(iii) take the advantage of batches and longer production run.

(iv) Provide flexibility to allow changes in production plans in view of change in demands, etc. and

(v) facilitate intermittent production.

Elementary Inventory Models (with Deterministic Demand)

Let us consider the inventory models in which demand is assumed to be fixed and completely pre-determined.

Notations

D - annual demand rate

V - unit purchase cost or unit cost of production (Rs./unit)

A - ordering or set up cost (Rs/order)

R - holding cost per Rs. per year (*Rs./Rs/year) (Inventory carrying charges factor)

B - shortage cost per Rs. short unit time (Rs/ Rs/ year)

Q - order quantity (to be determined

Inventory Cost

The heart of inventory analysis resides in the identification of relevant costs. Some of the important costs that apply to inventory situation are:

Ordering or set up costs

these are costs associated with ordering or manufacturing goods through purchasing or manufacturing and are known as set up costs or cost of ordering. Set up costs are generally assumed to be independent of the quantity ordered or produced.

Purchase cost or production cost

When large production runs are in process, these results in reduction of production cost per unit. Often, discounts are offered for the purchase of large quantities. In other words, often the unit cost of an item depends on the quantity procured or produced.

Inventory Holding Cost

The cost associated with carrying or holding the goods in stock are known as carrying or holding costs. These costs arise due to the storage costs, property taxes on the items in inventory, interest on the invested capital (interest on value of the inventory items, spillage of the inventory items, depreciation of the inventory items, transportation and handling of the items in inventory, etc.

Shortage or stock out costs

The costs that are incurred as a result of running out of stock are known as stock PUT TO SHORTAGE COSTS. As a result of shortages, sales or goodwill may be lost. If the unfulfilled demand for the items can be satisfied at a later date (back order case), in this case cost of back orders are assumed to vary directly with the shortage quantity (in rupee value) and the delaying time (Rs./ Rs.) . However, if the unfulfilled demand is lost (lost-sales case), in this case cost of shortages are assumed to vary directly with the shortage quantity (Rs./ unit shortage).

4.2.2 Role of EQO Basic Inventory Models

1. Economic Lot size or Economic Order Quantity Model

Assumptions:

1) The rate of demand for the item is deterministic and is constant D units per annum, independent of time.

2) Production rate is infinite, i.e. production is instantaneous

3) Shortages are not allowed

4) Lead time is zero or constant independent of demand and the quantity ordered.

5) The entire quantity is delivered as a single package (or production in a single run).

Objective:

To minimize the average annual variable cost.

Problem:

To determine when an order should be placed and how much quantity should be ordered.

The annual variable costs for this problem are two types –

1) ordering or set-up cost and

2) Inventory holding cost.

As Q is the order quantity and D is the annual demand, the number of orders per years will be D/Q. Therefore, the annual ordering cost will be = A.D/Q ..... (1)

4.2.3 Properties of EOQ model and Sensitivity Analysis

In the above nodal, various parameters are used such as demand (D), inventory carrying charges factor ®, ordering or set-up cost (A). These parameters are estimated and though they are assumed to be known, in real life what we have is an estimated value which may be different than real value for various reasons.

For this reason it is important for practical purposes to test the results of the EQQ model and find how sensitive the results are to the changes in various parameters.

The sensitivity can be explored in various ways. Let the “true” rate of demand is D, “ true” value of order cost is A, “ true” value of inventory holding cost is r and “true” value 9of unit purchase cost or production cost is v. Then the “true” optimal value of order quantity (Q*) will be,

In case when shortage costs are infinitely high (i.e. when shortages are not allowed) b = ¥ and eqn. 17 will reduce to

$Q^* = \sqrt{\frac{2AD}{rv}}$ This is same as equation (6), i.e. optimal order quantity for the E0-model. This is obvious since the EOQ model assume that no shortages are allowed which imply that the shortage are infinite

the basic inventory models are given below for easy understanding of the concept as well as to enable one solve the day to day Inventory problems too as far as determining the Economic Order Quantities , Time for ordering etc, .are concerned

The Classical Model

Corporate goals and strategies may sometimes conflict with EOQ. Measuring performance solely by inventory turns is one of the most prolific mistakes made in the name of inventory management. Many companies have achieved aggressive goals in increasing inventory turns only to find their bottom line has shrunk due to increased operational costs.

EOQ is essentially an accounting formula that determines the point at which the combination of order costs and inventory carrying costs are the least. The result is the most cost effective quantity to order. In purchasing this is known as the order quantity, in manufacturing it is known as the production lot size.

While EOQ may not apply to every inventory situation, most organizations will find it beneficial in at least some aspect of their operation. Anytime you have repetitive purchasing or planning of an item, EOQ should be considered. Obvious applications for EOQ are purchase-to-stock distributors and make-to-stock manufacturers, however, make-to-order manufacturers should also consider EOQ when they have multiple orders or release dates for the same items and when planning components and sub-assemblies. Repetitive buy maintenance, repair, and operating (MRO) inventory is also a good application for EOQ. Though EOQ is generally recommended in operations where demand is relatively steady, items with demand variability such as seasonality can still use the model by going to shorter time periods for the EOQ calculation. Just make sure your usage and carrying costs are based on the same time period.

Doesn't EOQ conflict with Just-In-Time? While I don't want to get into a long discussion on the misconceptions of what Just-In-Time (JIT) is, I will address the most common misunderstanding in which JIT is assumed to mean all components should arrive in the exact run quantities "just in time" for the production run. JIT is actually a quality initiative with the goal of eliminating wasted steps, wasted labor, and wasted cost. EOQ should be one of the tools used to achieve this. EOQ is used to determine which components fit into this JIT model and what level of JIT is economically advantageous for your operation. As an example, let us assume you are a lawn equipment manufacturer and you produce 100 units per day of a specific model of lawn mower. While it may be cost effective to have 100 engines arrive on your dock each day, it would certainly not be cost effective to have 500 screws (1 days supply) used to mount a plastic housing on the lawn mower shipped to you daily. To determine the most cost effective quantities of screws or other components you will need to use the EOQ formula.

The basic Economic Order Quantity (EOQ) formula is as follows:

$$EOQ = \sqrt{\frac{2(\text{Annual usage in units})(\text{Order cost})}{(\text{Annual carrying cost per unit})}}$$

The Inputs

While the calculation itself is fairly simple the task of determining the correct data inputs to accurately represent your inventory and operation is a bit of a project. Exaggerated order costs and carrying costs are common mistakes made in EOQ calculations. Using all costs associated with your purchasing and receiving departments to calculate order cost or using all costs associated with storage and material handling to calculate carrying cost will give you highly inflated costs resulting in inaccurate results from your EOQ calculation. I also caution against using benchmarks or published industry standards in calculations. I have frequently seen references to average purchase order costs of $100 to $150 in magazine articles and product brochures. Often these references trace back to studies performed by advocacy agencies working for business that directly benefit from these exaggerated (my opinion) costs used in ROI calculations for their products or services. I am not denying that some operations may have purchase costs in this range, especially if you are frequently re-sourcing, re-quoting, and/or buying from overseas vendors. However if your operation is primarily involved with repetitive buying from domestic vendors — which is more common — you'll likely see your purchase order costs in the substantially lower $10 to $30 range.

As you prepare to undertake this project keep in mind that even though accuracy is crucial, small variances in the data inputs generally have very little effect on the outputs. The following breaks down the data inputs in more detail and gives insight into the aspects of each.

Expressed in units, this is generally the easiest part of the equation. You simply input your forecasted annual usage.

Order Cost.

Also known as purchase cost or set up cost, this is the sum of the fixed costs that are incurred each time an item is ordered. These costs are not associated with the quantity ordered but primarily with physical activities required to process the order.

For **purchased items,** these would include the cost to enter the purchase order and/or requisition, any approval steps, the cost to process the receipt, incoming inspection, invoice processing and vendor payment, and in some cases a portion of the inbound freight may also be included in order cost. It is important to understand that these are costs associated with the frequency of the orders and not the quantities ordered. For example, in your receiving department the time spent checking in the receipt, entering the receipt, and doing any other related paperwork would be included, while the time spent repacking materials, unloading trucks, and delivery to other departments would likely not be included. If you have inbound quality inspection where you inspect a percentage of the quantity received you would include the time to get the specs and process the paperwork and not include time spent actually inspecting, however if you inspect a fixed quantity per receipt you would then include the entire time including inspecting, repacking, etc. In the purchasing department you would include all time associated with creating the purchase order, approval steps, contacting the vendor, expediting, and

reviewing order reports, you would not include time spent reviewing forecasts, sourcing, getting quotes (unless you get quotes each time you order), and setting up new items. All time spent dealing with vendor invoices would be included in order cost.

Associating actual costs to the activities associated with order cost is where many an EOQ formula runs afoul. Do not make a list of all of the activities and then ask the people performing the activities "how long does it take you to do this?" The results of this type of measurement are rarely even close to accurate. I have found it to be more effective to determine the percentage of time within the department consumed performing the specific activities and multiplying this by the total labor costs for a certain time period (usually a month) and then dividing by the line items processed during that same period.

It is extremely difficult to associate inbound freight costs with order costs in an automated EOQ program and I suggest it only if the inbound freight cost has a significant effect on unit cost and its effect on unit cost varies significantly based upon the order quantity.

In **manufacturing,** the order cost would include the time to initiate the work order, time associated with picking and issuing components excluding time associated with counting and handling specific quantities, all production scheduling time, machine set up time, and inspection time. Production scrap directly associated with the machine setup should also be included in order cost as would be any tooling that is discarded after each production run. There may be times when you want to artificially inflate or deflate set-up costs. If you lack the capacity to meet the production schedule using the EOQ, you may want to artificially increase set-up costs to increase lot sizes and reduce overall set up time. If you have excess capacity you may want to artificially decrease set up costs, this will increase overall set up time and reduce inventory investment. The idea being that if you are paying for the labor and machine overhead anyway it would make sense to take advantage of the savings in reduced inventories.

For the most part, order cost is primarily the labor associated with processing the order, however, you can include the other costs such as the costs of phone calls, faxes, postage, envelopes, etc.

Carrying cost.

Also called Holding cost, carrying cost is the cost associated with having inventory on hand. It is primarily made up of the costs associated with the inventory investment and storage cost. For the purpose of the EOQ calculation, if the cost does not change based upon the quantity of inventory on hand it should not be included in carrying cost. In the EOQ formula, carrying cost is represented as the annual cost per average on hand inventory unit. Below are the primary components of carrying cost.

Interest. If you had to borrow money to pay for your inventory, the interest rate would be part of the carrying cost. If you did not borrow on the inventory, but have loans on other capital items, you can use the interest rate on those loans since a reduction in inventory would free up money that could be used to pay these loans. If by some miracle you are debt free you would need to determine how much you could make if the money was invested.

Insurance. Since insurance costs are directly related to the total value of the inventory, you would include this as part of carrying cost.

Taxes. If you are required to pay any taxes on the value of your inventory they would also be included.

Storage Costs. Mistakes in calculating storage costs are common in EOQ implementations. Generally companies take all costs associated with the warehouse and divide it by the average inventory to determine a storage cost percentage for the EOQ calculation. This tends to include costs that are not directly affected by the inventory levels and does not compensate for storage characteristics. Carrying costs for the purpose of the EOQ calculation should only include costs that are variable based upon inventory levels.

If you are running a pick/pack operation where you have fixed picking locations assigned to each item where the locations are sized for picking efficiency and are not designed to hold the entire inventory, this portion of the warehouse should not be included in carrying cost since changes to inventory levels do not effect costs here. Your overflow storage areas would be included in carrying cost. Operations that use purely random storage for their product would include the entire storage area in the calculation. Areas such as shipping/receiving and staging areas are usually not included in the storage calculations. However. if you have to add an additional warehouse just for overflow inventory then you would include all areas of the second warehouse as well as freight and labor costs associated with moving the material between the warehouses.

Since storage costs are generally applied as a percentage of the inventory value you may need to classify your inventory based upon a ratio of storage space requirements to value in order to assess storage costs accurately. For example, let's say you have just opened a new E-business called "BobsWeSellEverything.com". You calculated that overall your annual storage costs were 5% of your average inventory value, and applied this to your entire inventory in the EOQ calculation. Your average inventory on a particular piece of software and on 80 lb. bags of concrete mix both came to $10,000. The EOQ formula applied a $500 storage cost to the average quantity of each of these items even though the software actually took up only 1 pallet position while the concrete mix consumed 75 pallet positions. Categorizing these items would place the software in a category with minimal storage costs (1% or less) and the concrete in a category with extreme storage costs (50%) that would then allow the EOQ formula to work correctly.

There are situations where you may not want to include any storage costs in your EOQ calculation. If your operation has excess storage space of which it has no other uses you may decide not to include storage costs since reducing your inventory does not provide any actual savings in storage costs. As your operation grows near a point at which you would need to expand your physical operations you may then start including storage in the calculation.

A portion of the time spent on cycle counting should also be included in carrying cost, remember to apply costs which change based upon changes to the average inventory level. So with cycle counting, you would include the time spent physically counting and not the time spent filling out paperwork, data entry, and travel time between locations.

Other costs that can be included in carrying cost are risk factors associated with obsolescence, damage, and theft. Do not factor in these costs unless they are a direct result of the inventory levels and are significant enough to change the results of the EOQ equation.

Variations

There are many variations on the basic EOQ model. I have listed the most useful ones below.

- Quantity discount logic can be programmed to work in conjunction with the EOQ formula to determine optimum order quantities. Most systems will require this additional programming.

- Additional logic can be programmed to determine max quantities for items subject to spoilage or to prevent obsolescence on items reaching the end of their product life cycle.
- When used in manufacturing to determine lot sizes where production runs are very long (weeks or months) and finished product is being released to stock and consumed/sold throughout the production run you may need to take into account the ratio of production to consumption to more accurately represent the average inventory level.
- Your safety stock calculation may take into account the order cycle time that is driven by the EOQ. If so, you may need to tie the cost of the change in safety stock levels into the formula.

4.2.4 Implementing EOQ

There are primarily two ways to implement EOQ. Both methods obviously require that you have already determined the associated costs. The simplest method is to set up your calculation in a spreadsheet program, manually calculate EOQ one item at a time, and then manually enter the order quantity into your inventory system. If your inventory has fairly steady demand and costs and you have less than one or two thousand SKUs you can probably get by using this method once per year. If you have more than a couple thousand SKUs and/or higher variability in demand and costs you will need to program the EOQ formula into your existing inventory system. This allows you to quickly re-calculate EOQ automatically as often as needed. You can also use a hybrid of the two systems by downloading your data to a spreadsheet or database program, perform the calculations and then update your inventory system either manually or through a batch program. Whichever method you use you should make sure to follow the following steps:

Test the formula. Prior to final implementation you must test the programming and setup. Run the EOQ program and then manually check the results using sample items that are representative of the variations of your inventory base.

Project results. You'll need to run a simulation or use a representative sampling of items to determine the overall short-term and long-term effects the EOQ calculation will have on warehouse space, cash flow, and operations. Dramatic increases in inventory levels may not be immediately feasible, if this is the case you may temporarily adjust the formula until arrangements can be made to handle the additional storage requirements and compensate for the effects on cash flow. If the projection shows inventory levels dropping and order frequency increasing, you may need to evaluate staffing, equipment, and process changes to handle the increased activity.

Maintain EOQ. The values for Order cost and Carrying cost should be evaluated at least once per year taking into account any changes in interest rates, storage costs, and operational costs.

A related calculation is the **Total Annual Cost** calculation. This calculation can be used to prove the EOQ calculation. Total Annual Cost = [(annual usage in units)/(order quantity)(order cost)]+{[.5(order quantity)+(safety stock)]*(annual carrying cost per unit)}. This formula is also very useful when comparing quotes where vendors offer different minimum order quantities, price breaks, lead times, transportation costs.

Use it! The EOQ calculation is "Hard Science", if you have accurate inputs the output is the most cost-effective quantity to order based upon your current operational costs. To further increase inventory turns you will need to reduce the order costs. E-procurement, vendor-managed inventories, bar coding, and vendor certification programs can reduce the costs associated with processing an order.

Equipment enhancements and process changes can reduce costs associated with manufacturing set up. Increasing forecast accuracy and reducing lead times which result in the ability to operate with reduced safety stock can also reduce inventory levels.

4.3 CODIFICATION / CATALOGUING

Codification is a process of assigning a unique code to an item for its easy and complete identification.

Code of an item is a unique set of numeric / alphanumeric values that describes the detailed nomenclature and specification, unit of measurement, location of storage and many other related information about an item.

It's brief and acts as a communicating mode for the item for different people and agencies.

Cataloguing refers to assigning a distinct code ,writing complete and detailed specifications of an item and listing all such items existing in an inventory.

Classification and codification of items are a necessity

for efficient control of inventory. They not only facilitate proper accounting and identification of Stores but also contribute immensely in standardization and variety reduction.

4.3.1 Why Codification / Cataloguing is required?

Any inventory consists of a number of items obtained from different sources / suppliers. Each supplier identifies its material in his own unique way.

Thousands and thousands of such materials enter into the inventory record. These items, depending upon the requirement, may require replenishment and thus their details may be required by many departments. Also, since requirements my be of repetitive nature there is a need for assigning a distinct code within the organization for all these materials coming from different sources ,bearing different numbers.

One of the ills of inventory listing is creation of duplicate record of an identical item. Same item may enter into an inventory record in different names. It's cataloguing and codification that eliminates such duplication chances and thus saving important money for the organization

4.3.2 How is codification / cataloguing done?

Any item that enters into a firm is codified provided it needs proper accounting for the present and the future.

For example , an item , a part of a machine that may be required in future also shall require a unique code and detailed catalogue as it may be referred to repeatedly in future.

Usually, all the items forming part of an inventory are catalogued and once prepared this catalogue is distributed among the different agencies such as indenting , planning, Finance, Purchasing and Stores departments.

Such items include those that come to stores or remain for use at their user location.

Codification / cataloguing is basically an identification system for each item of the inventory. There are often three broad approaches to developing a suitable identification system :

1. Arbitrary approach:

As the name suggests ,this approach does not use any design for codification. Rather , as and when an item is received by Stores in its receiving bay, a running and unique serial number is assigned to it. This number becomes the code of the item for subsequent use at different stages. While this system is the easiest one to use, it does not help in scientific management of inventory. For example, say a particular spare part of a machine is received in the stores and is assigned a running unique number 999XXX as its code. Then if the same item is received at any other point of time the code number shall not be the same i.e. 999XXX as by that time a lot many other items might have entered into the firm and might also have been assigned different running and unique code making it impossible to assign a previous code to any item. Arbitrary approach is useable only where perhaps items are non-repetitive and the inventory management need not be scientific.

2. Symbolic approach:

Also known as intelligent code system it assigns code in a manner that the same item is not allotted two different codes and also a code, because of its design, can be used to tell many things about an item.

The system uses either a numeric codification system or an alphanumeric or mnemonic system. Under the numeric system, a set of numeric code (length pre-decided) is assigned to each item where different parts of the code describe, of an item:

Class

Subclass

unique running number of that item

Location of storage

Suppliers' code etc.

For example :

2	145	098	344
Class	Subclass	Running number	Location code

Thus the code of this item shall be a 10 digit code, 2145098344 and it shall remain always so for this item. It shall then be easy to communicate about this item among the concerned agencies. Similarly, there can be code using alpha numeric value like AA223B234 with different alpha and numerical value describing some pre-decided meaning. It is also called mnemonic system. Both numeric and mnemonic systems are symbolic systems as the codes under it describe a symbol for identifying an item. Since this code has certain logic it is also called intelligent code and this system is in wide use every where.

Use of Drawing numbers

In many firms using complex drawings through which part numbers etc are drawn, use their drawing numbers as codes to identify an item. Since the drawing number for a firm remains unique , assigning a code on this basis assumes a unique code for that item and hence confirms the requirement of unique identification for the item.

4.3.3 Process of codification

Decide if the firm wants to go for arbitrary system, symbolic system or engineering drawing system

List the inventory items

Define the class of items such as (for example) :

Abrasives

Bearings

Belt and beltings

Bolts, nuts & washers

Brooms & brushes

Cans & containers

Chemicals & reagents

Cloth, leather & rubber

Electrical

Gases

Glassware

Oil & lubricants

Pipe & Pipe fittings

Photographic items

Safety items

Tools & tackles

Stationeries

Welding materials

Rolls

Refractory

Raw Materials

Building materials

Define the sub class under each class

Depending upon the number of classes , their subclasses and probable number of items under each sub class decide the length of codes which shall remain fixed for all the inventory items (10 digit, alphanumeric etc.)

Start assigning codes as per the detailed list of inventory

Who does the codification?

Normally, it is the custodian who does the codification for the items he keeps in his inventory. However, in firms of substantial sizes where good number of items are received on regular basis , codification is usually done by a team consisting of representatives drawn from Stores, user department and Industrial engineering department. Still, for Automatic procurement items the responsibility lies with the Stores department.

When codification?

Codification identifies an item. Also it acts as a communicating medium for an item among the different users of that item in whatever way such as Stores, User department, Planning department, Finance, Purchasing etc. Thus , as soon as the item enters into Stores (if item is a new one), it is codified. Once codified, the same code is used in the cycle of procurement, throughout and for ever.

4.4 MANAGEMENT OF AUTOMATIC PROCUREMENT ITEMS

Automatic Procurement (AP) items are those that have regular consumption pattern and are used by more than one user in an organization. Procurement action or such items are taken centrally and cyclically by one department which also is responsible for their custody and consumption regulation. AP items also known as Stock Control Items have thus the following **characteristics:**

Items that are used by more than one user
Items that have regular consumption
Items that are consumable in nature
Items for whom sources are available
AP items are identified and listed periodically in each Plant for the convenience of all the users. These items are grouped under various commodities like fasteners, Hardware items, Electrodes, Cables etc based on the nature of these items.

Monitoring of Planning, indenting, Stock and issue of such items are monitored by a central agency under Materials Management, known as “Stock Control”.

4.4.1 Planning of AP items & Indents Raising

The Indents for the procurement of AP items are raised centrally by Stock Control section. For most of the items the indents are generated automatically by the computer system based on the trends of past consumption without involving detailed planning process. However special requirement by different users, additional capital repair requirements are considered while finalizing the quantity for procurement

Procurement action for APIs

Like any other Inventory replenishment system, API system also seeks to answer the following questions:

When to order for replenishment?
How much quantity to order and
What system to follow?
Some of the systems followed in the automatic indent generation are listed below

4.4.2 Periodic Review System (PRS)

The periodic review system of indent raising is also known as calendar based system or System.

In this system, the stock position and consumption trends of different commodities are reviewed in a fixed time period and the indent is generated to cover the requirement up to the next review. Usually this review is done annually so that indents are raised for annual quantity.

Quantity System / Continuous monitoring / EOQ system

In the continuous monitoring system also known as Q-System, the stock position of items are monitored continuously through the system and the indents are raised for the items for which the stock level has reached a pre-fixed stock level.

The quantity for indent raising is usually a fixed quantity in this system known as Economic Order Quantity (EOQ), which is the quantity to be procured with minimum total cost (procurement cost +inventory carrying cost etc).

However in practice, the fixed quantity to be procured is the annual requirement quantity and the stock levels (Inventory) is maintained by scheduling the delivery suitably.

4.4.2 Safety Stock, Re-Order Level

As the stock outs of items have adverse effect on the continuous running of the plant and the production, care needs to be taken to ensure continuous availability of items. However as the consumption of items and the supply of the same may vary due to uncertainties, sufficient stocks of the items are needed to be maintained to take care of such variations which is known as safety stock.

Safety stock is the minimum stock to be maintained to take care of stock out situations due to variation in the consumption as well as supply. Safety Stock = Buffer Stock to take care of consumption variations+ Buffer stock to take care of supply variations.

Safety stock of an item is decided based on the criticality of that item and uncertainties involved in the consumption & supply of that item. So Safety Stock varies for various categories of items.

Re-Order level (ROL) is the stock level of an item at which the procurement activity is initiated by raising indent so that the items are received before the stock out of that item.

ROL = Quantity required for the consumption during the lead time of procurement+ Safety Stock

Based on the lead time of procurement of the item & its safety stock requirement, the ROL is fixed for each AP item.

Monitoring of Stock levels:

The stock levels of the AP items are continuously monitored by Stock Control by taking Exception Reports of items approaching Safety Stock level, ROL, nil stock etc. and takes suitable corrective measures to ensure the timely receipt and availability of AP items. The percentage level of availability of AP items to users when required is known as Service Level of AP items.

4.5 ABC ANALYSIS/XYZ ANALYSIS

ABC analysis is a business term used to define an inventoryation technique often used in material management

ABC analysis provides a mechanism for identifying items which will have a significant impact on overall inventory cost whilst also providing a mechanism for identifying different categories of stock that will require different management and controls

When carrying out an ABC analysis, inventory items are valued (item cost multiplied by quantity issued/consumed in period) with the results then ranked. The results are then grouped typically into three bands. These bands are called ABC codes.

4.5.1 ABC codes

"A class" inventory will typically contain items that account for 80% of total value, or 20% of total items.
"B class" inventory will have around 15% of total value, or 30% of total items.
"C class" inventory will account for the remaining 5%, or 50% of total items.
ABC Analysis is similar to Praetor the "A class" group will typically account for a large proportion of the overall value but a small percentage of the overall volume of inventory.

The ABC classification process is an analysis of a range of objects, such as finished products, items lying in inventory or customers into three categories. It's a system of categorization, with similarities to Pareto analysis, and the method usually categorizes inventory into three classes with each class having a different management control associated:

A - outstandingly important; B - of average importance; C - relatively unimportant as a basis for a control scheme.

Each category can and sometimes should be handled in a different way, with more attention being devoted to category A, less to B, and still less to C.

Popularly known as the "80/20" rule ABC concept is applied to inventory management as a rule-of-thumb. It says that about 80% of the Rupee value, consumption wise, of an inventory remains in about 20% of the items.

This rule , in general , applies well and is frequently used by inventory managers to put their efforts where greatest benefits , in terms of cost reduction as well as maintaining a smooth availability of stock, are attained.

The ABC concept is derived from the Pareto's 80/20 rule curve. It is also known as the 80-20 concept. Here, Rupee / Dollar value of each individual inventory item is calculated on annual consumption basis.

Thus, applied in the context of inventory, it's a determination of the relative ratios between the number of items and the currency value of the items purchased / consumed on a repetitive basis.

10-20% of the items (**'A' class**) account for 70-80% of the consumption

the next 15-25% (**'B' class**) account for 10-20% of the consumption and

the balance 65-75% (**'C' class**) account for 5-10% of the consumption

'A' class items are closely monitored because of the value involved (70-80% !).

High value (A), Low value (C) , intermediary value (B)

20% of the items account for 80% of total inventory consumption value (Qty consumed X unit rate)
Specific items on which efforts can be concentrated profitably
Provides a sound basis on which to allocate funds and time
A,B & C , all have a purchasing / storage policy - "A", most critically reviewed , "B" little less while "C" still less with greater results.

ABC Analysis is the basis for material management processes and helps define how stock is managed. It can form the basis of various activity including leading plans on alternative stocking arrangements (consignment stock), reorder calculations and can help determine at what intervals inventory checks are carried out (for example A class items may be required to be checked more frequently than c class stores

Inventory Control Application: The ABC classification system is to grouping items according to annual issue value, (in terms of money), in an attempt to identify the small number of items that will account for most of the issue value and that are the most important ones to control for effective inventory management. The emphasis is on putting effort where it will have the most effect.

4.5.2 High value (A), Low value (C) , intermediary value (B)

A Items: These Items are seen to be of high Rupee consumption volume. "A" items usually include 10-20% of all inventory items, and account for 50-60% of the total Rupee consumption volume.

B Items: "B" items are those that are 30-40% of all inventory items, and account for 30-40% of the total Rupee consumption volume of the inventory. These are important, but not critical, and don't pose sourcing difficulties.

C Items: "C" items account for 40-50% of all inventory items, but only 5-10% of the total Rupee consumption volume. Characteristically, these are standard, low-cost and readily available items.

ABC classifications allow the inventory manager to assign priorities for inventory control. Strict control needs to be kept on A and B items, with preferably low safety stock level. Taking a lenient view, the C class items can be maintained with looser control and with high safety stock level. The ABC concept puts emphasis on the fact that every item of inventory is critical and has the potential of affecting ,adversely, production, or sales to a customer or operations. The categorization helps in better control on A and B items.

In addition to other management procedures, ABC classifications can be used to design cycle counting schemes. For example, A items may be counted 3 times per year, B items 1 to 2 times, and C items only once, or not at all.

Suggested policy guidelines for A , B & C classes of items

A items (High cons. Val)	B items (Moderate cons. Val)	C item (Low cons. Val)
Very strict cons. control	Moderate control	Loose control
No or very low safety stock	Low safety stock	High safety stock
Phased delivery (Weekly)	Once in three months	Once in 6 months
Weekly control report	Monthly control report	Quarterly report
Maximum follow up	Periodic follow up	Exceptional
As many sources as possible	Two or more reliable	Two reliable
Accurate forecasts	Estimates on past data	Rough estimate
Central purchasing /storage	Combination purchasing	Decentralised
Max.efforts to control LT	Moderate	Min.clerical efforts
To be handled by Sr.officers	Middle level	Can be delegated

4.5.3 How to do ABC Analysis / Classification?

ABC analysis is a basic supply chain technique, often carried out by inventory controllers/materials managers, and is the starting point in Inventory control.

ABC classification is a system of categorization, with similarities to Pareto analysis and the method usually categorizes inventory into three classes with each class having a different management control associated.

Although different criteria may be applied to each category the typical method of "scoring" an inventory item is that of annual consumption value of said item (Qty consumed X Cost of item) with the result then ranked and then scored (A, B or C).

Classification may be specific to the industry but typically follows a 70%, 90%, 100% banding in that A class items represent 70% of the value, B class items fall between 70% and 90% of the annual value with C class the remaining.

In practical terms the complex high cost materials typically fall into the A class items, with the consumable, low cost (and typically fast moving) classed as C class.

How to carry out the actual analysis?

Carrying out ABC analysis is a bit tricky affair. What ultimately is done is to segregate all the inventory items into three categories viz. A, B & C.

ABC analysis can be done for any given data that has money value as the prime factor. For example classification of pending suppliers' bills, items of an MRO or any type of inventory ,expenditure over a period of time, customers with respect to sale value etc.

Procedural steps:

First of all, collect all the data of the inventory and calculate the consumption or sale value. For a Stores, maintaining inventory, this shall be Quantity issued X unit rate of an item, say x1. Similarly , get the values for all the remaining items, say , x2,x3,x4....x100 in the following way :

Slno.	Item	Unit rate	Consumption (Qty) issued)
1	x1	10	10
2	x2	12	10
3	x3	15	12
4	x4	20	5
5	x5	30	2
6	x6	5	100
7	x7	4	80
8	x8	16	12
9	x9	13	22
10	x10	35	6

2. Now, arrange all the consumption values in ascending or descending order of values. Let us assume we have listed in descending order (starting with highest consumption value item to lowest consumption value item)

3.Create next column and start adding the cumulative total of consumption value, starting from the top and finishing with the last item as given in the table below :

Consumption Value	Value in ascending order	Cumulative Value	Item	Class
100	60	560	x5	C
120	100	1160	x1	C
180	100	260	x4	C
100	120	380	x2	C
60	180	560	x3	C
500	192	752	x8	C
320	210	962	x10	B
192	286	1248	x9	B
286	320	1568	x7	A
210	500	2068	x6	A

From the last column it is clearly evident that the bottom 20 % of items (x6 & x7) consume together nearly 70% of value, upper 70% (x1, x2, x3, x4, x5, x8) items consume only 20% value and the remaining 10% items (x9) consume 10% value. Respectively, these are A,B and C classes of items

4.5.4 ABC Classification / Analysis of Inventory

The ABC classification process is an analysis of a range of objects, such as finished products, items lying in inventory or customers into three categories. It's a system of categorization, with similarities to Pareto analysis, and the method usually categorizes inventory into three classes with each class having a different management control associated:

A - outstandingly important; B - of average importance; C - relatively unimportant as a basis for a control scheme.

Each category can and sometimes should be handled in a different way, with more attention being devoted to category A, less to B, and still less to C.

Popularly known as the "80/20" rule ABC concept is applied to inventory management as a rule-of-thumb. It says that about 80% of the Rupee value, consumption wise, of an inventory remains in about 20% of the items.

This rule , in general , applies well and is frequently used by inventory managers to put their efforts where greatest benefits , in terms of cost reduction as well as maintaining a smooth availability of stock, are attained.

The ABC concept is derived from the Pareto's 80/20 rule curve. It is also known as the 80-20 concept. Here, Rupee / Dollar value of each individual inventory item is calculated on annual consumption basis.

Thus, applied in the context of inventory, it's a determination of the relative ratios between the number of items and the currency value of the items purchased / consumed on a repetitive basis.

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ABC Analysis is the basis for material management processes and helps define how stock is managed. It can form the basis of various activity including leading plans on alternative stocking arrangements (consignment stock), reorder calculations and can help determine at what intervals inventory checks are carried out (for example A class items may be required to be checked more frequently than c class stores

Inventory Control Application: The ABC classification system is to grouping items according to annual issue value, (in terms of money), in an attempt to identify the small number of items that will account for most of the issue value and that are the most important ones to control for effective inventory management. The emphasis is on putting effort where it will have the most effect.

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B Items: "B" items are those that are 30-40% of all inventory items, and account for 30-40% of the total Rupee consumption volume of the inventory. These are important, but not critical, and don't pose sourcing difficulties

C Items: "C" items account for 40-50% of all inventory items, but only 5-10% of the total Rupee consumption volume. Characteristically, these are standard, low-cost and readily available items.

ABC classifications allow the inventory manager to assign priorities for inventory control. Strict control needs to be kept on A and B items, with preferably low safety stock level. Taking a lenient view, the C class items can be maintained with looser control and with high safety stock level. The ABC concept puts emphasis on the fact that every item of inventory is critical and has the potential of affecting ,adversely, production, or sales to a customer or operations. The categorization helps in better control on A and B items.

XYZ Analysis

The XYZ analysis is a procedure of stock management in the management economics, with which on the basis empirical experiences, results are usually assigned to a classification by bill explosions or by the determination by variation and/or fluctuation coefficients of goods and articles concerning its turnover regularity (consumption and its predictable ness).

X constant consumption, fluctuations are rather rare

Y stronger fluctuations in consumption, usually for trend-moderate or seasonal reasons

Z completely irregular consumption

The XYZ analysis in the materials requirement Planning (materials requirements planning), in addition, in camp planning and in the calculation is used, frequently combined with the ABC analysis.

XYZ analysis is one of the basic supply chain techniques, often used to determine the inventory valuation inside a Store. It's also strategic as it intends to enable the Inventory manager in exercising maximum control over the highest stocked item, in terms of stock value. A system of categorization, with similarities to Pareto analysis, the method usually categorizes inventory into three bands with each band having a different management control associated. Although different criteria may be applied to each category the typical method of "scoring" an inventory item is that of annual stock value of said item (qty in stock X cost of item) with the result then ranked and then scored (X, Y or Z).

Bandings may be specific to the industry but typically follow a 70%, 90%, 100% banding in that X class items represent 70% of the stock value (although they may account for 20% number wise), Y class items fall between 70% and 90% of the annual stock value with C class the remaining. In practical terms the complex high cost materials typically fall into the X class items, with the consumable, low cost (and typically fast moving) classed as X class.

Not all stock is equally valuable and therefore doesn't require the same management focus. The results of the XYZ analysis provide information that helps evaluate how each inventory part should be monitored and controlled. These controls are typically:

X class items which are critically important and require close monitoring and tight control – while this may account for large value these will typically comprise a small percentage of the overall inventory count.

Y class are of lower criticality requiring standard controls and periodic reviews of usage

Z class require the least controls, are sometimes issues as “free stock” or forward holding.

Classification of inventory in terms of XYZ is also quite strategic as It can form the basis of various activity including leading plans on alternative stocking arrangements (consignment stock), reorder calculations and can help determine at what intervals inventory checks are carried out (for example X class items may be required to be checked more frequently than Z class stores.

Based on the ABC and XYZ analysis there is another control mechanism , popularly known as AX control.

4.5.5 AX Control

What is the AX category of items of Inventory?

Inventory plays an important role for any organization as it blocks the working capital which otherwise would have earned the organization some money. While the need for having inventory can’t be denied for any running plant / machinery, its availability in controlled measures too is highly desirable. Control techniques such as ABC and XYZ analyses though done in different ways, try, at the same time, to get maximum control with little commitment of resources.

One of the ways to have still better (tight) control over the inventory with still less commitment of resources is by determining the AX category of items in a given inventory. Once ABC and XYZ analyses have been done and a list of A and X classes of items is drawn then AX category is a combination of the two categories. Going by the definition of A and X separately, AX category of items, normally, display a high consumption (A) as well as a high stock value (X). Essentially, these items are high value, in terms of overall procurement cost including their being costly. Obviously , the measures that need to be taken to keep AX inventory under control is similar to that of A or X items, viz stock less number at any given time, have tight consumption control, more sources so that supply doesn’t become a constraint when needed etc.

Input Systems of Inventory Management

Structure

5.1 Glossary of Materials Management terms.

5.2 Activity-Based Costing (ABC)

- 5.2.1 Public sector use
- 5.2.2 Materials Management in an R & D set up
- 5.2.3 Advantages of Using Activity Based Costing

5.3 Sampling Plan

- 5.3.1 Types of acceptance sampling plans
- 5.3.2 Military Standard 105E
- 5.3.3 Supplier and Consumer Risks

5.4 Accounting System

5.5 Advanced payment in Material Management

5.6 Foreign Exchange Regulation

5.1 GLOSSARY OF MATERIALS MANAGEMENT TERMS

ABC Inventory Control

An inventory control approach based on the ABC volume or sales revenue classification of products (A items are highest volume or revenue, C—or perhaps D—are lowest-volume SKUs

Absolute Advantage

A competitive strength enjoyed by a party as a result of a natural endowment or other natural gifts that other parties do not have

Acceptance

The intentional indication of an offer to be bound by the terms of an offer

Acceptable Sampling Plan

In quality management, a specific plan that indicates the sampling sizes and the associated acceptance or non-acceptance criteria to be used.

Acceptance Testing

A statistical quality control technique used to evaluate the overall condition of a given lot by inspecting only a sample, drawn randomly from the lot

Accessorial Charges

Costs that carriers usually charge in addition to the transportation cost. They include single shipment, inside delivery, loading, unloading, notification and storage and redelivery charges.

Accessibility

The ability of a carrier to provide service between an origin and a destination.

Administered Price

A price determined by certain policies rather than by the competitive forces of the marketplace. For example, prices of sugarcane etc. in India is determined by the government rather than the market forces of demand and supply

AD Valorem Rate

Customs duty charged in terms of percentage on the value of goods that are dutiable, irrespective of quality, weight, or any other considerations. The ad Valorem rates of duty are ascertained from the invoice

Activity Based Costing

A method for calculating indirect costs, based on the activities that drive cost. This is in contrast to the classical accounting methods which pool and arbitrarily allocate indirect cost

Accounting System

The grouping of records and procedures that find out, record, classify and report information about the financial position and operations of an organization

Acculturation

The process of becoming familiar with another culture. It helps in conducting transnational businesses

Acknowledgement

A written communication used to inform the buyer by the supplier that the supplier has accepted the purchase order placed on him. An acknowledgement thus creates a bilateral contract as long as the terms of the acknowledgement are not significantly different from those of the purchase order

Acquisition Cost

Acquisition costs are the total costs associated with the acquisition of a material. Such costs include costs towards ordering, transportation, handling, inventory holding etc. It is noted in the context of the Economic Order Quantity (EOQ)

Acquisition Process

The sequential activities involved in obtaining necessary inputs for an organization is the Acquisition process. It includes determination of need, communication of need, identification of potential sources, invitation and consideration of bids, placement of the Purchase Order, receipt and inspection and making payment

Advance Payment

Payments in advance of delivery for a mutually agreed amounts or for specified percentage of the purchase price that buyer shall pay to the seller

Advance Shipping Notice

A standardized Electronic Data Interchange form detailing an inbound shipment to a receiving location (consignee)

Advanced charges

The amount of freight or other charges on a shipment advanced by one carrier to another, or to the shipper, to be collected from the consignee

Agency

It's a legal entity denoting the legal relationship that exists between two parties by which one is authorized to perform or transact specified business activities for the other

Agent

A person or an authorized another person or organization in dealings with a third party.

Air Waybill

A document used for shipment of air freight by national and international air carriers and declares therein the modesties shipped, shipping instructions and shipping costs.

Anticipated Inventories

Those stocks that are accumulated for a well defined future need. They differ from buffer (safety) stocks in that they are committed to specific future plans

ASP

Application Service Provider is an organization that provides software applications over the internet.

Carrying Cost

It is the per unit cost of holding inventory for a certain period of time. Usually, it is expressed in terms of percentage of the average inventory

Cartage

A charge made for hauling and transferring goods, on a local basis. It also denotes the physical movement of the goods

Cartel

An association , formal or otherwise of producers of the same commodity to control the market.

Cash Discount

In order to encourage quick payment by the buyer it is a percentage discount allowed on the invoiced amount

Cash On Delivery

Prior to release of the goods by the carrier , payment through cash mode for goods and transportation cost (total invoiced amount) asked by the seller from the buyer

Categorical Method

A method of rating supplier performance usually on a scale of plus, minus and neutral w.e.f.. a list of evaluation factors.

Caveat Emptor

Any purchase is done at the buyer's risk who has to beware ("Let the buyer beware"—Latin)

Centralized Purchasing

When Purchasing for the most of the organizational requirement is done by one agency, often called Purchasing department.

Certificate of origin

A document required by customs officials ,identifying the country of origin of imported materials

Certified Purchasing Manager

A world wide recognized certification program for the purchasing and supply professional conducted by the ISM, USA

Certified Supplier

A supplier whose Quality assurance system producing reliable product / service are accepted by the buyer. Inspection may not be done for this supplier's product

Change Order

A written authorization from the purchaser to the supplier on an existing order to change it. It is also called amendment to order

Class Freight Rate

Commodity rates are available only on selected commodities, a class rate can be found for all items shipped. It helps in simplifying the process of providing a specific rate for each commodity being shipped. It's thus a rate resulting from classification rating of the freight.

Coincident Indicator

A measure of economic activity that changes concurrently with changes in the business cycle

Collusion

A secret agreement or cooperation between two or more parties in which parties act in collusion to fix their bids in an advantageous manner eliminating the scope for genuine competitive bidding.

Collusive Bidding

An unholy and illegal practice in which suppliers act in collusion to fix their bids eliminating genuine competition in bidding. It's also known as formation of syndicate or cartel.

Commodity Council

Cross-functional teams and/or multi-division teams are responsible for selecting suppliers, negotiating contracts and monitoring supplier performance including quality and delivery performance

Commodity Freight Rate

It's a transportation rate for a specific commodity, moving between specified points, in a certain direction and for a specific minimum quantity.

The purpose of the commodity rate is to provide a lower rate to reflect the economic benefits to the carrier resulting from more predictable and larger quantity movements over certain routes.

Commodity Segmentation

It refers to dividing a firm's total spending into categories of goods and services in order to leverage spending and increase purchasing efficiency. Common practice involves using a matrix to divide the commodities into four quadrants: Acquisition - low risk, low value items, Critical - high risk, low value, Leverage- low risk, high value and Strategic-high risk, high value items

Common Carrier

A carrier that serves all kinds of customers but carries only the types of freight for which it holds itself out to carry. It helps in enabling transportation to the needy, knowledge of rates, provision of service on a schedule, service availability in a designated area and most importantly service for a given class of commodity and movement

Common Market

A market with no internal tariffs, common external tariffs and free flow of labour and capital

Comparative Advantage

A competitive strength that a country enjoys in producing a product more efficiently than other countries

Competent Parties

Parties entering into a contract must be in a position to enter into contract and execute it

Competitive Bidding

It's a method of awarding a contract in which bids are invited from competing vendors through a notice inviting bids. Usually , the award is made on the lowest price offering bidder.

Competitive proposals

A proposal , in response to the bidding invitation by a vendor in the face of other bidders proposal out of which one or more may enter into contract is a competitive proposal

Concealed Damage

Damage to the contents of a package that seems to in good condition externally

Consequential Damages

Loss of profit / earning incurred by purchaser as a result of a seller's breach

Consideration

An exchange of value for value, required to form a valid contract

Consignee

The person or organization to whom a shipper directs the carrier to deliver the goods, generally the purchaser of the goods

Consignment Buying

A method of procurement in which a supplier maintains inventory on the premises of the purchaser. The purchaser pays for the goods only when goods are used or issued from the stock

Consignor

The shipper of a specified quantity of goods

Consolidation

Combining less than truck load shipments from various facilities at a centrally located point and transporting them as a large shipment, generally at a lower freight rate

Consortium

A small group of businesses that join forces in purchasing selected products.

Early Purchasing Involvement (EPI)

A practice involving supply management professionals in a new product development process from its inception

Early Supplier Involvement (ESI)

A practice that brings together one or more selected suppliers with a buyer's product design team early in the product development process

E-Business

A means of doing business that uses electronic technologies such as EDI, Internet, Web based supply chain integration to the benefit of an organization. It's also known as E-commerce

Economic Indicators

Activities that change relative to the economy

Economic Order Quantity

A deterministic model that minimizes total acquisition and inventory carrying cost. Popularly it is known as EOQ

Economies of Scale

The reduction in average unit costs experienced as an organization's volume increases

Electronic Commerce

Utilization of technology of the computer, including such tools as EDI, the internet, intranets, Extranets to do commercial transaction

Electronic Data Interchange

Popularly known as EDI it's computer to computer exchange of business information in a standard format. Transaction documents are transmitted electronically from purchaser's computer to the seller's computer

Electronic Fund Transfer

The electronic transmission of funds from one party, usually the Purchaser to other party, usually the Supplier. The transfer is often done through internet using credit card

Electronic Requisitions

Purchase requisitions / Indents generated and transmitted by computer, replacing paper forms

Marketplace

A place to conduct e-commerce where sellers and purchasers meet on the net. It is used for purchasing , auctioning etc.

Embargo

A government's total ban on trade with a specific country

Enterprise

A complete business organization from front line employees to top management, all functions in between

ERP

Enterprise Resource Planning refers to a system that integrates various functions within an organization. It may be used for forecasting, Materials Management etc. It's a computerized system now a days

Escalation Clause

A contract clause permitting a specified increase in the price of goods or services in the event of certain conditions. Such a clause also specifies de-escalation

Established Market Price

A current price generated in the usual course of business between buyers and sellers free to bargain and which can be substantiated from an independent source

Exchange Barriers

The restrictions imposed on exchanging a country's currency against those of other countries

Exchange Rate

The price of a currency as it is being exchanged for another

Exempt Commodities

Commodities that are not subject to import duties or can be transported exempt of regulation

Expediting

Contacting a supplier or carrier with the goal of speeding up the delivery date of an inbound shipmen

Export license

A permit from a host country government, enabling organizations to take goods out of a country

Express Warranty

A specific assurance made by the seller concerning the performance , quality, or nature of the goods or services sold

External Customer

The ultimate marketplace purchaser / user of an organization's outputs

Economy of Scale

A phenomenon whereby larger volumes of production reduce unit cost by distributing fixed costs over a larger quantity.

EDI Standards

Criteria that define the data content and format requirements for specific business transactions (e.g. purchase orders). Using standard formats allows companies to exchange transactions with multiple trading partners easily.

Efficient Consumer Response (ECR)

A demand driven replenishment system designed to link all parties in the logistics channel to create a massive flow-through distribution network. Replenishment is based upon consumer demand and point of sale information.

Electronic Commerce (EC)

Also written as e-commerce. Conducting business electronically via traditional EDI technologies, or online via the Internet. In the traditional sense of selling goods, it is possible to do this electronically because of certain software programs that run the main functions of an e-commerce website, such as product display, online ordering, and inventory management. The definition of e-commerce includes business activity that is business-to-business (B2B), business-to-consumer (B2C).

Electronic Data Interchange (EDI)

Inter-company, computer-to-computer transmission of business information in a standard format. For EDI purists, "computer-to-computer" means direct transmission from the originating application program to the receiving, or processing, application program. An EDI transmission consists only of business data, not any accompanying verbiage or free-form messages. Purists might also contend that a standard format is one that is approved by a national or international standards organization, as opposed to formats developed by industry groups or companies.

Electronic Funds Transfer (EFT)

A computerized system that processes financial transactions and information about these transactions or performs the exchange of value. Sending payment instructions across a computer network, or the company-to Company, company-to-bank, or bank-to-bank electronic exchange of value.

End-of-Life Inventory

Inventory on hand that will satisfy future demand for products that are no longer in production at your entity.

Enterprise Resource Planning (ERP) System

A class of software for planning and managing "enterprise-wide" the resources needed to take customer orders, ship them, account for them and replenish all needed goods according to customer orders and forecasts. Often includes electronic commerce with suppliers. Examples of ERP systems are the application suites from SAP, Oracle, PeopleSoft and others.

FEE

In cost reimbursement contracts , an agreed upon amount beyond the initial cost estimate , usually reflecting a variety of factors, including risk and services. The fee may be fixed initially (Cost-plus-fixed-fee arrangement) or it may vary (cost-plus-incentive-fee or cost-plus-award-fee arrangement)

FIFO

First in - First out, describes the flow of inventory. It is average costing where rather than keeping track of the inventory value of individual units of the same item separately, they are averaged so that all units of the same items of inventory have the same value

Fill Rate

The percentage of requisitions filled from stock present on the shelf. The inverse of it is "Stock out rate.

Financial Lease

Financing for the full life of a piece of equipment

Finished Goods
Goods that have completed the manufacturing or assembly process and are ready for sale to external customers

Firm Bid
It's a legal offer to sell which can become a contract simply on acceptance by the buyer

Force Majeure
Major and usually uncontrollable events, that excuse a party from the performance of its obligations. The contract provision is referred to as the "Act of God" and is kept in the contract to protect both the purchaser as well as the supplier

Forecasting
Projection of future business conditions and their impact on the organization

Foreign Freight Forwarder
A party that acts to arrange for export and import movement of goods for shippers and consignees

Form, Fit & Function
An overall quality related term common in purchase agreements that encompasses the physical attributes of something (from), its desired outputs or performance (function) and fitness (appropriate for the application)

Forward Buying
Buying in excess of current requirements, as a strategy because of an anticipated shortages, strikes, price increase etc

Free Alongside Vessel
Under this arrangement, the supplier agrees to deliver the goods in proper condition along side the vessel. The buyer assumes all subsequent risks and expenses after delivery to the pier

Free On Board
These are shipping terms under which title is transferred between the supplier and the purchaser at the FOB point. There are many arrangements under FOB such as:

* FOB destination: Under it the seller bears risk until the goods are transported to the buyer's dock, after which the risk will pass to the buyer.

* FOB destination, Freight collect: Title passes from the supplier to the buyer at the destination point and freight charges are the responsibility of the purchaser. The supplier owns the goods in transit and is responsible for filling loss and damage claims against the carrier, but the purchaser pays and bears the freight charges and files any overcharge claims.

* FOB destination, Freight prepaid: Title passes from the supplier to the buyer at destination point and freight charges are paid by the supplier. The supplier pays and bears the freight charges, owns the goods in transit and may file claims for overcharges, loss and damage.

* FOB destination, Freight prepaid and Invoiced: Title passes at the destination point; freight charges are paid by the supplier and added to the invoice. The supplier pays the freight charges, owns the goods in transit and file claims for overcharges, loss and damage. The purchaser ultimately bears the freight charges.

* FOB Origin: The seller bears the risk until it loads the goods onto an appropriate carrier after which the buyer assumes the risk of loss and must claim against the carrier for damage or loss in transit.

* FOB Origin, Freight allowed: Purchaser obtains title where the shipment originates and is responsible for all claims against the carrier but the supplier pays the freight charges.

* FOB Origin, Freight Collect: Title passes on to the buyer at the point of origin and the buyer must pay the freight charges. The buyer owns the goods in transit and files all claims against the carrier.

* FOB Origin, Freight Prepaid and Invoiced: Title passes to the buyer at the point of origin , freight charges are paid by the supplier and then collected from the purchaser by adding them to the invoice. The supplier pays the freight charges and files claims for overcharges. The purchaser bears the freight charges , owns the goods in transit and files claims for loss and damage with the carrier.

Free Trade
The uninhibited flow of goods and services across national boundaries

Free Trade Zone
A site in which imported goods are exempted from custom duties. Countries establish it to encourage economic development such as manufacturing and distribution

Freight Bill
The carrier's invoice for transportation charges applicable to a shipment

Freight Claim
A claim against a carrier due to loss of , or damage to, goods transported by that carrier, also for erroneous rates and weights in assessment of freight charges

Freight Forwarder
A third party , licensed to make transportation arrangements

Functional Acknowledgement
A standardized EDI form that indicates the receipt of a shipment. It is automatically generated and sent back to the shipping organization.

Futures Contracts
Contracts for the purchase or sale and delivery of commodities or currencies at a specified future date, primarily used as a hedging device against market price fluctuations or unforeseen supply shortages

Fair-share Quantity Logic
In inventory management, the process of equitably allocating available stock among field distribution centers. Fair-share quantity logic is normally used when stock available from a central inventory location is less than the cumulative requirements of the field stocking locations. The use of fair-share quantity logic involves procedures that "push" stock out to the field, instead of allowing the field to "pull" in what is needed. The objective is to maximize customer service from the limited available inventory.

Field Finished Goods
Inventory which is kept at locations outside the four walls of the manufacturing plant (i.e., distribution center or warehouse).

Field warehouses
A warehouse on the property of the owner of the goods that stores goods that are under the custody of a bonafide public warehouse manager. The public warehouse receipt is used as collateral for a loan.

Finished Goods Inventory (FG or FGI)
Products completely manufactured, packaged, stored, and ready for distribution.

Finite Forward Scheduling
An equipment scheduling technique that builds a schedule by proceeding sequentially from the initial period to the final period while observing capacity limits. A Gantt chart may be used with this technique.

First In, First Out (FIFO)
Warehouse term meaning first items stored are the first used. In accounting this tem is associated with the valuing of inventory such that the latest purchases are reflected in book inventory. Also see: Book Inventory

Fixed Costs
Costs, which do not fluctuate with business volume in the short run. Fixed costs include items such as depreciation on buildings and fixtures.

Fixed interval inventory model
A setup wherein each time an order is placed for an item, the same (fixed) quantity is ordered.

Fixed Order Quantity
A lot-sizing technique in ERP or inventory management that will always cause planned or actual orders to be generated for a predetermined fixed quantity, or multiples thereof if net requirements for the period exceed the fixed order quantity.

Fixed Reorder Cycle Inventory Model
A form of independent demand management model in which an order is placed every "n" time units. The order quantity is variable and essentially replaces the items consumed during the current time period. Let "M" be the maximum inventory desired at any time, and let x be the quantity on hand at the

time the order is placed. Then, in the simplest model, the order quantity will be M – x. The quantity M must be large enough to cover the maximum expected demand during the lead time plus a review interval. The order quantity model becomes more complicated whenever the replenishment lead time exceeds the review interval, because outstanding orders then have to be factored into the equation. These reorder systems are sometimes called fixed-interval order systems, order level systems, or periodic review systems. Synonyms:

Fixed Reorder Quantity Inventory Model
A form of independent demand item management model in which an order for a fixed quantity is placed whenever stock on hand plus on order reaches a predetermined reorder level. The fixed order quantity may be determined by the economic order quantity, by a fixed order quantity (such as a carton or a truckload), or by another model yielding a fixed result. The reorder point may be deterministic or stochastic, and in either instance is large enough to cover the maximum expected demand during the replenishment lead time. Fixed reorder quantity models assume the existence of some form of a perpetual inventory record or some form of physical tracking, e.g., a two-bin system that is able to determine when the reorder point is reached.

Fixed-Location Storage
A method of storage in which a relatively permanent location is assigned for the storage of each item in a storeroom or warehouse. Although more space is needed to store parts than in a random-location storage system, fixed locations become familiar, and therefore a locator file may not be needed. Also see: Random-Location Storage Flag of convenience: A ship owner registers a ship in a nation that offers conveniences in the areas of taxes, manning, and safety requirements; Liberia and Panama are two nations known for flags of convenience.

FOB Destination
Title passes at destination, and seller has total responsibility until shipment is delivered.

FOB Origin
Title passes at origin, and buyer has total responsibility over the goods while in shipment.

For-hire carrier
A carrier that provides transportation service to the public on a fee basis.

Forecast
An estimate of future demand. A forecast can be constructed using quantitative methods, qualitative methods, or a combination of methods, and it can be based on extrinsic (external) or intrinsic (internal) factors. Various forecasting techniques attempt to predict one or more of the four components of demand: cyclical, random, seasonal, and trend

Forecast Cycle
Cycle time between forecast regenerations that reflect true changes in marketplace demand for shippable end products.

Forklift truck
A machine-powered device that is used to raise and lower freight and to move freight to different warehouse locations

Fourth-Party Logistics (4PL)
Differs from third party logistics in the following ways; 1)4PL organization is often a separate entity established as a joint venture or long-term contract between a primary client and one or more partners; 2)4PL organization acts as a single interface between the client and multiple logistics service providers; 3) All aspects (ideally) of the client's supply chain are managed by the 4PL organization; and, 4) It is possible for a major third-party logistics provider to form a 4PL organization within its existing structure (Strategic Supply Chain Alignment; John Gattorna).

Free Alongside Ship (FAS)
A term of sale indicating the seller is liable for all changes and risks until the goods sold are delivered to the port on a dock that will be used by the vessel. Title passes to the buyer when the seller has secured a clean dock or ship's receipt of goods.

Free on Board (FOB)
Contractual terms between a buyer and a seller, that define where title transfer takes place.

Freezing inventory balances
In most cycle counting programs the term "freezing" refers to copying the current on-hand inventory balance into the cycle count file. This may also be referred to as taking a snapshot of the inventory balance. It rarely means that the inventory is actually frozen in a way that prevents transactions from occurring.

Freight-all-kinds (FAK)
An approach to rate making whereby the ante is based only upon the shipment weight and distance; widely used in TOFC service.

Freight bill
The carrier's invoice for transportation charges applicable to a freight shipment.

Freight Consolidation
The grouping of shipments to obtain reduced costs or improved utilization of the transportation function. Consolidation can occur by market area grouping, grouping according to scheduled deliveries, or using third-party pooling services such as public warehouses and freight forwarders.

Freight Forwarder
An organization which provides logistics services as an intermediary between the shipper and the carrier, typically on international shipments. Freight forwarders provide the ability to respond quickly and efficiently to changing customer and consumer demands and international shipping (import/export) requirements.

Frozen Zone]
In forecasting, this is the period in which no changes can be made to scheduled work orders based on changes in demand. Use of a frozen zone provides stability in the manufacturing schedule.

General Agents

Agents with broad powers and considerable latitude in using their own judgment to carry out duties assigned to them by their principals

GATT

Multilateral agreements created in 1947 to reduce barriers to world trade. Succeeded by the World Trade Organization (WTO)

Global Sourcing

The procurement of goods or services outside the limits of a country i.e. international

Global Tender

A tender which is open internationally for offers by the interested tenderness. It is given wide publicity so as to have global reach

Goods Booked to Self

A term used in Railway transportation where the delivery of the consignment can be taken only on production of the Railways Receipt

Gain Sharing

A method of incentive compensation where supply chain partners share collectively in savings from productivity improvements. The concept provides an incentive to both the buying and supplier organizations to focus on continually reevaluating, re-energizing, and enhancing their business relationship. All aspects of value delivery are scrutinized, including specification design, order processing, inbound transportation, inventory management, obsolescence programs, material yield, forecasting and inventory planning, product performance and reverse logistics. The focus is on driving out limited value cost while protecting profit margins.

General commodities carrier

A common motor carrier that has operating authority to transport general commodities, or all commodities not listed as special commodities.

General-merchandise warehouse

A warehouse that is used to store goods that are readily handled, are packaged, and do not req1ire a controlled environment.

Global Trade Item Number (GTIN

A unique number that comprises up to 14 digits and is used to identify an item (product or service) upon which there is a need to retrieve pre-defined information that may be priced, ordered or invoiced at any point in the supply chain. The definition covers raw materials through end user products and includes services, all of which have pre-defined characteristics. GTIN is the globally-unique

EAN.UCC System identification number, or key, used for trade items (products and services). It's used for uniquely identifying trade items (products and services) sold, delivered, warehoused, and billed throughout the retail and commercial distribution channels. Unlike a UPC number, which only provides information specific to a group of products, the GTIN gives each product its own specific identifying number, giving greater accuracy in tracking.

Gondola

A rail car with a flat platform and sides three to five feet high; used for top loading of items that are long and heavy.

Goods Received Note (GRN)

Documentation raised by the recipient of materials or products as a mark of receipt of goods.

Gross Inventory

Value of inventory at standard cost before any reserves for excess and obsolete items are taken.

Gross weight

The total weight of the vehicle and the payload of freight or passengers.

Hand -to-mouth buying

Frequent purchases in small quantities to meet only immediate , short term requirements

Also, it is a practice of planning inbound material purchases and flows without the need for significant inventory levels

Hazardous Materials

Materials or substances that have been determined by a government agency to be a risk to health, safety and property and thus need to comply with the prescribed safeguards. The term includes such items as explosives, flammables, poisons, corrosive, radio active substances. These materials must be packaged, labeled, handled and transported according to strict regulations from several agencies. International shipments must comply with docket HM-181, where the term "dangerous goods" is often used interchangeably with hazardous materials

Hedging

A purchase or sale entered into for the purpose of balancing a sale or purchase already made or under contract, in order to offset the effect of potential market price fluctuations.

Host Country

Any country where an organization has its world headquarters

Hundred Weight

100 pounds, a unit of weight used in transportation

High Sea Sale

It describes the transfer of Goods from the buyer when the material is on high sea

Holding Cost

Also called Carrying cost, it is the average cost of carrying a unit of an inventory item. It normally includes opportunity cost of holding inventory and other related costs such as overhead and variable costs

Hub

A large retailer or manufacturer having many trading partners

Handling Costs

The cost involved in moving, transferring, preparing, and otherwise handling inventory.

Hawthorne Effect

From a study conducted at the Hawthorne Plant of Western Electric Company in 1927-1932 which found that the act of showing people that you are concerned usually results in better job performance. Studying and monitoring of activities are typically seen as being concerned and results in improved productivity

Hedge Inventory

A form of inventory buildup to buffer against some event that may not happen. Hedge inventory planning involves speculation related to potential labor strikes, price increases, unsettled governments, and events that could severely impair a company's strategic initiatives. Risk and consequences are unusually high, and top management approval is often required.

Heijunka

In the Just-in-Time philosophy, an approach to level production throughout the supply chain to match the planned rate of end product sales.

Honeycombing

1. The practice of removing merchandise in pallet load quantities where the space is not exhausted in an orderly fashion. This results in inefficiencies due to the fact that the received merchandise may not be efficiently stored in the space which is created by the honey-combing.

2. The storing or withdrawal or supplies in a manner that results in vacant space that is not usable for storage of other items. 3. Creation of unoccupied space resulting from withdrawal of unit loads. This is one of the major hidden costs of warehousing.

Hopper cars

Rail cars that permit top loading and bottom unloading of bulk commodities; some hopper cars have permanent tops with hatches to provide protection against the elements.

Horizontal Play/Horizontal Hub

This is a term for a function that cuts across many industries, usually defines a facility or organization that is providing a common service.

1) A large retailer or manufacturer having many trading partners.

2) A reference for a transportation network as in "hub and spoke" which is common in the airline and trucking industry. For example, a hub airport serves as the focal point for the origin and termination of

long-distance flights where flights from outlying areas are fed into the hub airport for connecting flights.

3) A common connection point for devices in a network.

4) A Web "hub" is one of the initial names for what is now known as a "portal". It came from the creative idea of producing a website, which would contain many different "portal spots" (small boxes that looked like ads, with links to different yet related content). This content, combined with Internet technology, made this idea a milestone in the development and appearance of websites, primarily due to the ability to display a lot of useful content and store one's preferred information on a secured server. The web term "hub" was replaced with portal.

Hybrid Inventory System

An inventory system combining features of the fixed reorder quantity inventory model and the fixed reorder cycle inventory model. Features of the fixed reorder cycle inventory model and the fixed reorder quantity inventory model can be combined in many different ways. For example, in the order point-periodic review combination system, an order is placed if the inventory level drops below a specified level before the review date; if not, the order quantity is determined at the next review date. Another hybrid inventory system is the optional replenishment model.

5.2 ACTIVITY-BASED COSTING

Activity-Based Costing (ABC) is a costing model that identifies activities in an organization and assigns the cost of each activity resource to all products and services according to the actual consumption by each: it assigns more indirect cost (overhead)into direct costs.

In this way an organization can establish the true cost of its individual products and services for the purposes of identifying and eliminating those which are unprofitable and lowering the prices of those which are overpriced. In a business organization, the ABC methodology assigns an organization's resource costs through activities to the products and services provided to its customers. It is generally used as a tool for understanding product and customer cost and profitability. As such, ABC has predominantly been used to support strategic decisions such as pricing, outsourcing and identification and measurement of process improvement initiatives. Traditionally cost accountants easily added a broad percentage of expenses onto the Direct cost the indirect cost. However as the percentages of indirect or overhead cost is technique became increasingly inaccurate because the indirect costs were not caused equally by all the products. For example, one product might take more time in one expensive machine than another product, but since the amount of direct labor and materials might be the same, the additional cost for the use of the machine would not be recognized when the same broad 'on-cost' percentage is added to all products. Consequently, when multiple products share common costs, there is a danger of one product subsidizing another.

The concepts of ABC were developed in the manufacturing sector during the 1970s and 1980s. During this time, the Consortium of advanced learning idea a formative role for studying and formalizing the principles that have become more formally known as Activity-Based Costing.

Rob Robert S Kaplan Balanced score card these concepts in a number of articles published in *Harvard Business Review* beginning in 1988. Cooper and Kaplan described ABC as an approach to solve the problems of traditional cost management systems are often unable to determine accurately the actual

costs of Production costs of related services. Consequently managers were making decisions based on inaccurate data especially where there are multiple products. Instead of using broad arbitrary percentages to allocate costs, ABC seeks to identify cause and effect relationships to objectively assign costs. Once costs of the activities have been identified, the cost of each activity is attributed to each product to the extent that the product uses the activity. In this way ABC often identifies areas of high overhead costs per unit and so directs attention to finding ways to reduce the costs or to charge more for costly products. Activity-based costing was first clearly defined in 1987 by Robert S Kaplan and W.Bruns as a chapter in their book *Accounting and Management: A Field Study Perspective*. They initially focused on manufacturing industry where increasing technology and productivity improvements have reduced the relative proportion of the direct costs of labor and materials, but have increased relative proportion of indirect costs. For example, increased automation has reduced labor, which is a direct cost, but has increased depreciation, which is an indirect cost.

Like manufacturing industries, financial institutions also have diverse products and customers which can cause cross-product cross-customer subsidies. Since personnel expenses represent the largest single component of non-interest expense in financial institutions, these costs must also be attributed more accurately to products and customers. Activity based costing, even though originally developed for manufacturing, may even be a more useful tool for doing this.

- Cost allocation
- Fixed cost
- Variable cost
- Cost driver
- Cost driver rate

Direct Labour and materials are relatively easy to trace directly to products, but it is more difficult to directly allocate indirect costs to products. Where products use common resources differently, some sort of weighting is needed in the cost allocation process. The measure of the use of a shared activity by each of the products is known as the **cost driver**, the cost of the activity of bank tellers can be ascribed to each product by measuring how long each product's transactions takes at the counter and then by measuring the number of each type of transaction

Uses

- It helps to identify inefficient product, department and activity
- It helps to allocate more resources on profitable product, department and activity
- It helps to control the cost at individual level and on departmental level
- It helps to find unnecessary costs

Limitations

Even in activity-based costing, some overhead costs are difficult to assign to products and customers, for example the chief executive's salary. These costs are termed 'business sustaining' and are not assigned to products and customers because there is no meaningful method. This lump of unallocated overhead costs must nevertheless be met by contributions from each of the products, but it is not as large as the overhead costs before ABC is employed. Although some may argue that costs untraceable to activities should be "arbitrarily allocated" to products, it is important to realize that the only purpose

of ABC is to provide information to management. Therefore, there is no reason to assign any cost in an arbitrary manner.

Cost

ABC is considered a relatively costly accounting methodology, and whether it is good value is questioned. ABC has been found to be a very high-cost accounting technology. Installing an ABC system is technically complex, requiring talented personnel and a considerable amount of time and money.

Prevalence

Following initial enthusiasm, ABC lost ground in the 1990s, to alternative metrics, such as Kaplan's balanced score card & economic score

5.2.1 Public Sector Use

ABC is widely used in the public sector, including by the United States and UK Police mandated since the 2003-04 uk tax year England and Wales' National Policing Plan, specifically the Policing Performance Assessment Framework An independent 2008 report concluded that ABC was an inefficient use of resources: it was expensive and difficult to implement for small gains, and a poor value, and that alternative methods should be used.

5.2.2 Materials Management In An R & D Set Up

In a typical R & D set up, the following characteristics are easily visible w.e.f.. an R&D (research) project particular project is pursued only once or rarely more than once the project duration is small enough to provide the results at the earliest for use Project conceiving may or may not be predetermined. It may be sudden and resultant of the brain wave of a scientist Project findings may get early implementation for commercial production Projects, mostly, are of pilot nature i.e. of low value and less time duration. Many projects may need materials as tools for diagnosis, tests and trials. Obviously, based on the above characteristics which are essentially a way of working for any industrial R & D set up, the material requirement too is peculiar with the following characteristics:

Item is not repetitive, it may be required only once Purchase function should ensure speedy procurement Element of proper planning w.e.f.. timely raising of indent , exact specification, correct estimated price may be missing Quantity of items to be purchased is small Sourcing may not be easy as items are developmental in nature, mostly new

Often, the requirement of materials and the nature of purchases are at cross purpose. For example, an item is required urgently but the exact specification is not available, quantity is too small for the vendors to show interest, item is new and the sources are not known etc. These and other situations eventually become the limiting factors for the purchase man who wants to reduce the Lead time in purchasing. It is a fact of life for the Purchase man that the delivery gets delayed, sometimes enormously, as despite of the agreed delivery schedule the vendor could not complete the job solely because the item was of developmental nature and the time it took for completion could not be assessed precisely in the beginning's & D purchases, therefore, are significantly different from those done in a manufacturing unit where there is enough control on the variables. At least, specification of an item that determines the item to be purchased is frozen. Sources, to a great extent, are also known

and therefore constant in nature. The only variables can be price and delivery schedule. As against it, in an R&D set up there is lack of adequate information on sources, likely price and a justified delivery schedule. Specification often remains a variable until just prior to placement of order.

Considering that urgent need to procure the material that too on , say short notices at times is of primary concern in an R & D set up what should be the procurement system or put in other words, can there be a procurement system that can take care of urgent needs where exact specification, sources and likely delivery schedule are difficult propositions

5.2.3 Activity Based Costing Advantages

More accurate costing of products/services, customers, SKUs, distribution channels

Better understanding overhead

Easier to understand for everyone

Utilizes unit cost rather than just total cost

Integrates well with Six Sigma and other continuous improvement programs

Makes visible waste and non-value added

Supports performance management and scorecards

Enables costing of processes, supply chains, and value streams

Activity Based Costing mirrors way work is done

Facilitates benchmarking

5.3 ACCEPTANCE SAMPLING PLANS

Acceptance sampling is a procedure used for sentencing incoming batches. The most widely used plans are given by the Military Standard tables, which were developed during World War II.

5.3.1 Types of acceptance sampling plans

Sampling plans can be categorized across several dimensions:

Sampling by attributes vs. sampling by variables: When the item inspection leads to a binary result (either the item is conforming or nonconforming) or the number of nonconformities in an item are counted, then we are dealing with sampling by attributes. If the item inspection leads to a continuous measurement, then we are sampling by variables.

Incoming vs. outgoing inspection: If the batches are inspected before the product is shipped to the consumer, it is called outgoing inspection. If the inspection is done by the consumer, after they were received from the supplier, it is called incoming inspection.

Rectifying vs. non-rectifying sampling plans: Determines what is done with nonconforming items that were found during the inspection. When the cost of replacing faulty items with new ones, or reworking them is accounted for, the sampling plan is rectifying.

Single, double, and multiple sampling plans: The sampling procedure may consist of drawing a single sample, or it may be done in two or more steps. A double sampling procedure means that if the sample taken from the batch is not informative enough, another sample is taken. In multiple sampling, additional samples can be drawn after the second sample.

5.3.2 Military Standard 105E (ISO 2859, ANSI/ASQC Z1.4)

The original version of the standard (MIL STD 105A) was issued in 1950. The last revision (MIL STD 105E) was issued in 1989, but canceled in 1991. The standard was adopted by the International Standards Organization as ISO 2859.The tables give inspection plans for sampling by attributes for a given batch size and acceptable_quality level (AQL). An inspection plan includes: the sample size/s (n), the acceptance number/s ©, and the rejection number/s ®. The single sampling procedure with these parameters is as follows: Draw a random sample of n items from the batch. Count the number of nonconforming items within the sample (or the number of nonconformities, if more than one non conformity is possible on a single item). If the number of nonconforming items is c or less, accept the entire batch. If it is r or more then reject it. In most cases r =c+1 (for double and multiple plans, there are several values for the sample sizes, acceptance, and rejection numbers).The standard includes three types of inspection (normal, tightened, and reduced inspection). The type of inspection that should be applied depends on the quality of the last batches inspected. At the beginning of inspection, normal inspection is used. The types of inspection differ as follows:

- Tightened inspection (for a history of low quality) requires a larger sample size than in under normal inspection.
- Reduced sampling (for a history of high quality) has a higher acceptance number relative to normal inspection (so it is easier to accept the batch)
- There are special switching rules between the three types of inspection, as well as a rule for discontinuation of inspection. These rules are empirically based.

5.3.3 Supplier and Consumer Risks

The supplier risk is the risk that a batch of high quality (according to the AQL) is rejected. The consumer risk is the risk that a batch of low quality will be accepted. The military standard plans assure a supplier risk of 0.01-0.1 (depending on the plan). The only way to control the consumer risk is by changing the inspection level.

5.4 ACCOUNTING SYSTEM

To be able to manage a company efficiently, one should always have full information about both each particular business process and the whole company. Accounting can not always provide the top manager with such information, because it focuses mostly on the needs of external entities like tax office. The purpose of the management accounting is to provide full and trustworthy information necessary for making correct management decisions and plans. The management accounting reflects all factual expenses and revenues of the company, so a top manager can get a clear picture of the company operation and make reasonable decisions. To solve the management accounting tasks, our company applies a self-made Management Accounting System - MACSYS. This automated system makes it easier to make management decisions, providing the top managers with necessary information in a convenient way.

The MACSYS system automates the business processes, helps control the executive discipline, and enables remote work with the information.

Major tasks the system solves:

- Providing the efficient management tools
- Improving the executive discipline control
- Improving the labor productivity due to reduced document circulation time
- Accumulating the information for further use as a knowledge base
- Optimizing the business processes, automating the mechanism of their execution and control
- Formalizing document circulation processes

MACSYS is an integrated system. The following major modules serve for automating the accounting and management of different company activity facets:

Staff/Organizational Structure Management Module

The module reflects the organizational structure in the automated system. Departments, sub-departments, and positions are formed according to the company's staff list. According to their authority, the person in charge can change the organizational structure representation in the automated system, modifying the information about departments, sub-departments, and positions, designating the employees on existing positions, setting the amount of their salaries depending on the remuneration scheme. The staff manager get the necessary tools for performing their tasks: inputting and accounting the company staff information. This module does not only reflect the current company's organizational structure. Above all, this is an informational basis for normal operation of the production management module

Production Management Module

The system contains the tools for working with the information about all production process components: customers, projects, developers, and financial documents The module automates all the company's production process steps:

Customer information Management

Entering the new project information. Dividing the project into tasks. Initial estimating the work load and terms of completion. Assigning the persons responsible for particular tasks according to the company's organizational structure. Determining all project participants' rates. Confirming the project work start distributing and giving specific tasks to individuals or sub-departments according to the company's organizational structure. Assigning authorities and subordination within a project collecting the information about completion of the tasks within a project: the time spent, current direct and overhead costs, the project completion progress. Organizing the reporting system at all organizational structure levels within a project controlling the completion of particular tasks and the whole project Distributing the work among the team members, if necessary Displaying the total project information for managers of different levels Closing and archiving the project after completion. The module allows to solve practical tasks of planning and estimating the project, distributing of work among the team members, assigning the persons in charge, and controlling the project completion. All employees involved in the project are provided with actual information depending on their positions to solve their tasks. For example, the developers are given information on the tasks that they participate in, the managers are given all information about the projects and employees that they supervise. The top managers get information about the whole company's activity. Of course, each employee's access rights can be configured individually

Customer Relationship Module

This module is a set of programming interfaces for entering and managing information about our customers. The module has a powerful functionality that the commonly used software tools "Customer Relationship Management" (CRM) normally have, like: Entering, storing, and modifying the private customer information Customer relationship history. The list of project performed for the customer with all related information (work load estimates, project schedule, employees involved, expenses). The customer payment history - the list of invoices submitted and paid Total information on completed, current, and future projects, as detailed as necessary

Revenues/Expenses Analysis Module

The data analysis tools are necessary to the company managers of all levels. Especially important is the financial accounting, because it is the financial analysis that helps determine the company's financial situation and success.

This module is used by the company's finance department and provides:

Cost Analysis. This can be a comparative analysis of different managers' work, analysis of directions, customers, analysis of efficiency of departments, developer groups, individuals, etc

Profit Analysis. The analysis of the profit brought by the activity of particular manager, department, or group. The profit of each project group can be also analyzed

Cost-efficiency analysis. The general analysis of profit and costs to find out the cost efficiency of a project, customer, etc

Analysis of profit as an annual percent of the capital invested. The capital is subject to calculation based on the financial analysis data

Accounting and analysis of debts

The financial analysis is a powerful management and decision-making tool. To make the analysis effective, we tried to allow for storage and display of a lot of source information that can be represented as detailed or summary reports

Reporting Module

Apart from the general reports that are usual and regulated, our company's management accounting allows to create individual reports at the top managers' request. The management accounting provides data for any kinds of reports and parameters. Each key position has a set of reports necessary for their everyday work:

The task performer is given a form to input the task information. This information will be used for controlling the work completion and calculating the performer's salary. The Project Leader has access to all their subordinates' reports and the project summary report

The Top Manager uses the reports on the projects that they supervise, including the Project Leaders' and developers' reports, reports on the Customers and the financial operations between the company and the Customers .The Production Department manager gets the necessary data on manpower/material resource distribution for planning. The Personnel Department manager can get reports on the company's employees/positions. The Financial Department can get reports on direct and overhead costs, relationship with the customers, etc

Accounting Interfacing Module

One of the main principles of the system is one-time data input, which allows to use the information stored in the system both for the management and accounting. The Accounting Interfacing Module exports the necessary data from MACSYS to the external accounting software.

The major principles that MACSYS abides by are:

- Multi-choice data representation principle
- Accounting rules observance principle
- One-time data input principle
- Configuration flexibility principle
- Management information security and access distribution principle

Our program's main advantages are:

Using the advanced architecture: Microsoft .Net C#, the high-level development language allowing implementing the business logic quickly. The possibility of remote work from anywhere in the world: the whole functionality is accessible by Internet via a secure channel

5.5 ADVANCE PAYMENT

Prepayment, full or partial payment for goods and services before they are received by the University in good order or rendered satisfactorily

Purpose of the Policy

Generally, goods and services provided to the University are paid for after receipt. On occasion, it may be necessary to provide a known and reputable vendor with an advance payment (prepayment). This policy describes (A) general provisions regarding advance payments, (B) requirement for Purchase Order notation, (C) submission of invoice, (D) accounting reconciliation, (E) receiving and documentation, and (F) needed approvals.

II. Detailed Policy Statement

A. General Provisions

1. Advance payments or prepayments shall be avoided whenever possible. It is prudent business practice not to pay for goods or services until they have been received in good order or rendered satisfactorily.Also, the University may suffer loss of interest on funds used to make advance payments, especially if delivery of materials or performance of services is to take place at some future date.

2. Exceptions to the policy may include:

- foreign orders
- high-cost equipment manufactured to meet functional specifications
- books, periodicals and newspapers, including special order items for trade and professional publications
- collection of research specimens in the field
- caterers for food and beverage service for large official functions where caterer requires a deposit
- charges for research expeditions; including deposits and/or reservations for other group transportation and/or expenses
- principal investigators and other research personnel who conduct research using human subjects and pay the subjects a small amount (check for entire amount is paid to the investigator or experiment controller)
- vendors who offer substantial prepayment discounts
- maintenance service contracts

- honoraria; see UCSC Policy ACG0007: *Honoraria, Fellowships, Scholarships and Other Unsupported Check Requests*
- membership dues; see UCSC Policy ACG0008: *University Sponsored Memberships in Organizations*
- seminar and colloquia registration fees; see UCSC Policy TRE0001: *Travel Expense Payments and Reimbursements*
- performing artists, when contract requires payment before performance begins; see UCSC Policy MM0004: *Purchasing Personal and Professional Services*
- products for resale by UCSC Bookstore
- low value items (under $2,500 total value*)*

B. Purchase Order

The total amount of the purchase order shall include the value of the advance payment and a full description of the refund policy.

C. Invoice

Companies to whom an advanced payment is to be issued must provide an invoice (or written confirmation of total cost, including tax, freight, handling) for the full amount of the advance payment prior to the issuance of the advance payment. Advance payments issued to individuals must be supported by documentation indicating the need for the advance payment.

D. Accounting Reconciliation

Advance payments issued to companies are charged directly to the unit's expenditure account. Advance payments issued to individuals are charged to an advance account. The unit's expenditure account will be charged upon submission of receipts or other supporting documentation.

E. Receiving and Documentation

Units are responsible for receiving the goods/services associated with the advance payment and for collecting and processing all supporting documentation. This supporting documentation must be forwarded to the General Accounts Payable Office (a sub-unit of Accounting Services in the Financial Affairs unit) when the advance payment is issued to an individual. Upon receipt of the documentation, the unit's expenditure account will be charged. When the payment is issued to a company, the documentation is retained in the unit.

F. Approval

1. Unit personnel who have been delegated purchasing authority may approve acceptable advance payments listed in II.A.2. above.

2. The Purchasing and Accounting departments will review, and the Director of Materiel Management must approve requests for advance payments that are outside the scope of those listed in II.A.2. above.

5.6 FOREIGN EXCHANGE REGULATION

An Act to consolidate and amend the law regulating certain payments, dealings in foreign exchange and securities, transactions indirectly affecting foreign exchange and the import and export of currency, for the conservation of the foreign exchange resources of the country and the proper utilization thereof in the interests of the economic development of the country.

BE it enacted by Parliament in the Twenty-fourth Year of the Republic of India as follows :-

- Short title, extent, application and commencement
- This Act may be called the Foreign Exchange Regulation Act, 1973.
- It extends to the whole of India.
- It applies also to all citizens of India outside India and to branches and agencies outside India of companies or bodies corporate, registered or incorporated in India.
- It shall come into force on such date as the Central Government may, by notification in the Official Gazette, appoint in this behalf:
- Provided that different dates may be appointed for different provisions of this Act and any reference in any such provision to the commencement of this Act shall be construed as a reference to the coming into force of that provision.

Definitions

In this Act, unless the context otherwise requires, -

- Appellate Board" means the Foreign Exchange Regulation Appellate Board constituted by the Central Government under sub-section(1)of section 52;
- authorized dealer" means a person for the time being authorized under section 6 to deal in foreign exchange;
- bearer certificate" means a certificate of title to securities by the delivery of which (with or without endorsement) the title to the securities is transferable;
- certificate of title to a security" means any document used in the ordinary course of business as proof of the possession or control of the security, or authorizing or purporting to authorize, either by an endorsement or by delivery, the possessor of the document to transfer or receive the security thereby represented;
- coupon" means a coupon representing dividends or interest on a security; The provisions of F.E.R. (Amendment) Act, 1993 (hereafter referred to as Act 29 of 1993) came into force on the 8th day of January 1993.
- currency" includes all coins, currency notes, banks notes, postal notes, postal orders, money orders, Cheques, drafts, traveler's Cheques, letters of credit, bills of exchange and promissory notes;
- foreign currency" means any currency other than Indian currency;
- foreign exchange" means foreign currency and includes -
- all deposits, credits and balances payable in any foreign currency, and any drafts, traveler's Cheques, letters of credit and bills of exchange, expressed or drawn in Indian currency but payable in any foreign currency;

- any instrument payable, at the option of the drawee or holder thereof or any other party thereto, either in Indian currency or in foreign currency or partly in one and partly in the other;
- foreign security" means any security created or issued elsewhere than in India, and any security the principal of or interest on which is payable in any foreign currency or elsewhere than in India;
- Indian currency" means currency which is expressed or drawn in Indian rupees but does not include special bank notes and special one-rupee notes issued under section 28A of the Reserve Bank of India Act, 1934;
- Indian custom waters" means the waters extending into the sea to a distance of twelve nautical miles measured from the appropriate base line on the coast of India and includes any bay, gulf, harbor, creek or tidal river;
- money-changer" means a person for the time being authorized under section 7 to deal in foreign currency;
- overseas market", in relation to any goods, means the market in the country outside India and in which such goods are intended to be sold;
- owner", in relation to any security, includes any person who has power to sell or transfer the security, or who has the custody thereof or who receives, whether on his own behalf or on behalf of any other person, dividends or interest thereon, and who has any interest therein, and in a case where any security is held on any trust or dividends or interest thereon are paid into a trust fund, also includes any trustee or any person entitled to enforce the performance of the trust or to revoke or vary, with or without the consent of any other person, the trust or any terms thereof, or to control the investment of the trust moneys;
- person resident in India" means -
- a citizen of India, who has, at any time after the 25th day of March, 1947, been staying in India but does not include a citizen of India who has gone out of, or stays outside, India, in either case—
- for or on taking up employment outside India, or
- for carrying on outside India a business or vocation outside India, or
- for any other purpose, in such circumstances as would indicate his intention to stay outside India for an uncertain period;
- a citizen of India, who having ceased by virtue of paragraph (a) or paragraph (b) or paragraph (c) of sub-clause (I) to be resident in India, returns to, or stays in, India, in either case -
- for or on taking up employment in India, or
- for carrying on in India a business or vocation in India, or
- for any other purpose, in such circumstances as would indicate his intention to stay in India for an uncertain period;
- a person, not being a citizen of India, who has come to, or stays in, India, in either case -
- for or on taking up employment in India, or
- for carrying on in India a business or vocation in India, or
- for staying with his or her spouse, such spouse being a person resident in India, or
- for any other purposes, in such circumstances as would indicate his intention to stay in India for an uncertain period;
- a citizen of India, who, not having stayed in India at any time after the 25th day of March, 1947, comes to India for any of the purposes referred to in paragraphs (a), (b) and (c) of sub-clause (iii) or for the purpose and in the circumstances referred to in paragraph (d) of that sub-clause or having come to India stays in India for any such purpose and in such circumstances.

- Explanation - A person, who has, by reason only of paragraph (a) or paragraph (b) or paragraph (d) of sub-clause (iii) been resident in India, shall, during any period in which he is outside India, be deemed to be not resident in India;
- Person resident outside India" means a person who is not resident in India;
- Precious stone" includes pearl and semi-precious stone and such other stone or gem as the Central Government may for the purposes of this Act, notify in this behalf in the Official Gazette;
- "Prescribed" means prescribed by rules made under this Act;
- Reserve Bank" means the Reserve Bank of India;
- security" means shares, stocks, bonds, debentures, debenture stock, Government securities as defined in the Public Debt Act, 1944, savings certificates to which the Government Savings Certificates Act, 1959 applies, deposit receipts in respect of deposits of securities, and units or sub-units of unit trusts and includes certificates of title to securities, but does not include bills of exchange or promissory notes other than Government promissory notes;
- Transfer", in relation to any security, includes transfer by way of loan or security. Classes of officers of Enforcement

There shall be the following classes of officers of Enforcement, namely:-

- Directors of Enforcement;
- Additional Directors of Enforcement;
- Deputy Directors of Enforcement;
- Assistant Directors of Enforcement; and
- Such other class of officers of Enforcement as may be appointed for the purposes of this Act.
- Appointment and powers of officers of Enforcement

The Central Government may appoint such persons as it thinks fit to be officers of Enforcement.

Without prejudice to the provisions of sub-section (1), the Central Government may authorize a Director of Enforcement or an Additional Director of Enforcement or a Deputy Director of Enforcement or an Assistant Director of Enforcement to appoint officers of Enforcement below the rank of an Assistant Director of Enforcement. Subject to such conditions and limitations as the Central Government may impose, an officer of Enforcement may exercise the powers and discharge the duties conferred or imposed on him under this Act.

Entrustment of functions of Director

The Central Government may, by order and subject to such conditions and limitations as it thinks fit to impose, authorize any officer of customs or any Central Excise Officer or any police officer or any other officer of the Central Government or a State Government to exercise such of the powers and discharge such of the duties of the Director of Enforcement or any other officer of Enforcement under this Act as may be specified in the order.

Authorized dealers in foreign exchange

- The Reserve Bank may, on an application made to it in this behalf, authorize any person to deal in foreign exchange.
- An authorization under this section shall be in writing and -
- May authorize transactions of all descriptions in foreign currencies or may be restricted to authorizing dealings in specified foreign currencies only;
- May authorize dealings in all foreign currencies or may be restricted to authorizing specified transactions only;
- May be granted to be effective for a specified period, or within specified amounts;
- May be granted subject to such conditions as may be specified therein.

Any authorization granted under sub-section (1) may be revoked by the Reserve Bank at any time if the Reserve Bank is satisfied that, -

it is in the public interest to do so; or

the authorized dealer has not complied with the conditions subject to which the authorization was granted or has contravened any of the provisions of this Act or of any rule, notification, direction or order made there under:

Provided that no such authorization shall be revoked on the ground specified in clause (ii) unless the authorized dealer has been given a reasonable opportunity for making a representation in the matter.

Any authorized dealer shall, in all his dealings in foreign exchange and in the exercise and discharge of the powers and of the functions delegated to him under section 74, comply with such general or special directions or instructions as the Reserve Bank may, from time to time, think fit to give, and, except with the previous permission of the Reserve Bank, an authorized dealer shall not engage in any transaction involving any foreign exchange which is not in conformity with the terms of his authorization under this section.

An authorized dealer shall, before undertaking any transaction in foreign exchange on behalf of any person, require that person to make such declarations and to give such information as will reasonably satisfy him that the transaction will not involve, and is not designed for the purpose of, any contravention or evasion of the provisions of this Act or of any rule, notification, direction or order made there under, and where the said person refuses to comply with any such requirement or makes only unsatisfactory compliance therewith, the authorized dealer shall refuse to undertake the transaction and shall, if he has reason to believe that any such contravention or evasion as aforesaid is contemplated by the person, report the matter to the Reserve Bank.

Money-changers

The Reserve Bank may, on an application made to it in this behalf, authorize any person to deal in foreign currency.

An authorization under this section shall be in writing and -

- May authorize dealings in all foreign currencies or may be restricted to authorizing dealings in specified foreign currencies only;
- may authorize transactions of all descriptions in foreign currencies or may be restricted to authorizing specified transactions only;
- May be granted with respect to a particular place where alone the money changer shall carry on his business;
- May be granted to be effective for a specified period, or within specified amounts;
- May be granted subject to such conditions as may be specified therein.
- Any authorization granted under sub-section (1) may be revoked by the Reserve Bank at any time if the Reserve Bank is satisfied that -

it is in the public interest to do so; or

- the money-changer has not complied with the conditions subject to which the authorization was granted or has contravened any of the provisions of this Act or of any rule, notification, direction or order made there under:

Provided that no such authorization shall be revoked on the ground specified in clause (ii) unless the money-changer has been given a reasonable opportunity for making a representation in the matter.

- The provisions of sub-sections (4) and (5) of section 6 shall, in so far as they are applicable, apply in relation to a money-changer as they apply in relation to an authorized dealer.

Explanation - In this section, "foreign currency" means foreign currency in the form of notes, coins or traveler's Cheques and "dealing" means purchasing foreign currency in the form of notes, coins or traveler's Cheques or selling foreign currency in the form of notes or coins.

- Restrictions on dealing in foreign exchange

- Except with the previous general or special permission of the Reserve Bank, no person other than an authorized dealer shall in India, and no person resident in India other than an authorized dealer shall outside India, purchase or otherwise acquire or borrow from, or sell, or otherwise transfer or lend to or exchange with, any person not being an authorized dealer, any foreign exchange:
- Provided that nothing in this sub-section shall apply to any purchase or sale of foreign currency effected in India between any person and a money-changer.

Explanation - For the purposes of this sub-section, a person, who deposits foreign exchange with another person or opens an account in foreign exchange with another person, shall be deemed to lend foreign exchange to such other person.

Except with the previous general or special permission of the Reserve Bank, no person, whether an authorized dealer or a money-changer or otherwise, shall enter into any transaction which provides for

the conversion of Indian currency into foreign currency or foreign currency into Indian currency at rates of exchange other than the rates for the time being authorized by the Reserve Bank.

Where any foreign exchange is acquired by any person, other than an authorized dealer or a money-changer, for any particular purpose, or where any person has been permitted conditionally to acquire foreign exchange, the said person shall not use the foreign exchange so acquired otherwise than for that purpose or, as the case may be, fail to comply with any condition to which the permission granted to him is subject, and where any foreign exchange so acquired cannot be so used or the conditions cannot be complied with, the said person shall, within a period of thirty days from the date on which he comes to know that such foreign exchange cannot be so used or the conditions cannot be complied with, sell the foreign exchange to an authorized dealer or to a money-changer.

For the avoidance of doubt, it is hereby declared that where a person acquires foreign exchange for sending or bringing into India any goods but sends or brings no such goods or does not send or bring goods of a value representing the foreign exchange acquired, within a reasonable time or sends or brings any goods of a kind, quality or quantity different from that specified by him at the time of acquisition of the foreign exchange, such person shall, unless the contrary is proved, be presumed not to have been able to use the foreign exchange for the purpose for which he acquired it or, as the case may be, to have used the foreign exchange so acquired otherwise than for the purposes for which it was acquired.

Nothing in this section shall be deemed to prevent a person from buying from any post office, in accordance with any law or rules made there under for the time being in force, any foreign exchange in the form of postal orders or money orders.

Restrictions on payments

Save as may be provided in and in accordance with any general or special exemption from the provisions of this sub-section which may be granted conditionally or unconditionally \by the Reserve Bank, no person in, or resident in, India shall -

Make any payment to or for the credit of any person resident outside India;

Receive, otherwise than through an authorized dealer, any payment by order or on behalf of any person resident outside in India.

Explanation - For the purposes of this clause, where any person in, or resident in, India receives any payment by order or on behalf of any person resident outside India through any other person (including an authorized dealer) without a corresponding inward remittance from any place outside India, then, such person shall be deemed to have received such payment otherwise than through an authorized dealer;

Draw, issue or negotiate any bill of exchange or promissory note or acknowledge any debt, so that a right (whether actual or contingent) to receive a payment is created or transferred in favour of any person resident outside India;

Make any payment to, or for the credit of, any person by order or on behalf of any person resident outside India;

Place any sum to the credit of any person resident outside India;

Make any payment to, or for the credit of, any person or receive any payment for, or by order or on behalf of, any person as consideration for or in association with -

The receipt by any person of a payment or the acquisition by any person of property outside India,

The creation or transfer in favour of any person of a right (whether actual or contingent) to receive payment or acquire property outside India;

draw, issue or negotiate any bill of exchange or promissory note, transfer any security or acknowledge any debt, so that a right (whether actual or contingent) to receive a payment is created or transferred in favour of any person as consideration for or in association with any matter referred to in clause (f).

Where a person has failed to comply with the requirements of sub-section (1) in relation to any foreign exchange or payment in rupees, the Reserve Bank may give to him such directions as appear to be expedient for the purposes of securing the receipt of the foreign exchange or payment, as the case may be.

Payment for exported goods

The Central Government may, by notification in the Official Gazette, prohibit the taking or sending out by land, sea or air (hereafter in this section referred to as export) of all goods or of any goods or class of goods specified in the notification from India directly or indirectly to any place so specified unless the exporter furnishes to the prescribed authority a declaration in the prescribed form supported by such evidence as may be prescribed or so specified and true in all material particulars which, among others, shall include the amount representing -

The full export value of the goods; or if the full export value of the goods is not ascertainable at the time of export, the value which the exporter, having regard to the prevailing market conditions, expects to receive on the sale of the goods in the overseas market, and affirms in the said declaration that the full export value of the goods (whether ascertainable at the time of export or not) has been, or will within the prescribed period be, paid in the prescribed manner.

If the Central Government is of opinion that it is necessary or expedient in the public interest so to do, it may, by notification in the Official Gazette, specify any goods, from among those goods to which a notification under clause (a) applies, and direct that in respect of the goods so specified, where an exporter makes a declaration under sub-clause (ii) of clause (a) of the value which he, having regard to the prevailing market conditions expects to receive on the sale of such goods in the overseas market, he shall not, except with the permission of the Reserve Bank on an application made to the Reserve Bank by the exporter in this behalf, authorize or permit or allow or in any manner be a party to, the sale of such goods for a value less than that declared:

Provided that no permission shall be refused by the Reserve Bank under this clause unless the exporter has been given a reasonable opportunity for making a representation in the matter:

Provided further that where the exporter makes an application to the Reserve Bank for permission under this clause and the Reserve Bank does not, within a period of twenty days from the date of receipt of the application, communicate to the exporter that permission applied for has been refused, it shall be presumed that Reserve Bank has granted such permission.

Explanation - In computing the period of twenty days for the purposes of the second proviso, the period, if any, taken by the Reserve Bank for giving an opportunity to the exporter for making a representation under the first proviso shall be excluded.

Where any export of goods, to which a notification under clause (a) of sub-section (1) applies, has been made, no person shall, except with the permission of the Reserve Bank, do or refrain from doing anything, or take or refrain from taking any action, which has the effect of securing -

In a case falling under sub-clause (i) or sub-clause (ii) of clause (a) of sub-section (1), -

That payment for the goods - Is made otherwise than in the prescribed manne or

Is delayed beyond the period prescribed under clause (a) of sub-section (1), or that the proceeds of sale of the goods exported do not represent the full export value of the goods subject to such deductions, if any, as may be allowed by the Reserve Bank; and in a case falling under sub-clause (ii) of clause (a) of sub-section (1), also that the sale of the goods is delayed to an extent which is unreasonable having regard to the ordinary course of trade:

Provided that no proceedings in respect of any contravention of the provisions of this sub- section shall be instituted unless the prescribed period has expired and payment for the goods representing the full export value has not been made in the prescribed manner within the prescribed period.

Where in relation to any goods to which a notification under clause (a) of sub-section (1) applies the prescribed period has expired and payment therefore has not been made as aforesaid, it shall be presumed, unless the contrary is proved by the person who has sold or is entitled to sell the goods or to procure the sale thereof, that such person has not taken all reasonable steps to receive or recover the payment for the goods as aforesaid and he shall accordingly be presumed to have contravened the provisions of sub-section (2).

Where in relation to any goods to which a notification under clause (a) of sub-section (1) applies the prescribed period has expired and payment therefore has not been made as aforesaid, the Reserve Bank may give to any person who has sold the goods or who is entitled to sell the goods or procure the sale thereof, such directions as appear to it to be expedient for the purpose of securing - if the goods have been sold, the payment therefore, or if the goods have not been sold, either the sale of the goods and payment therefore as aforesaid, or the re-import of the goods into India as the circumstances permit, within such period as the Reserve Bank may specify in this behalf and without prejudice to the generality of the foregoing provision, may direct that the goods, the right to receive the payment

therefore or any other right to enforce such payment shall be transferred or assigned to the Central Government or to a person specified in the directions.

Where any goods or a right to receive payment or any other right to enforce such payment, are or is transferred or assigned in accordance with sub-section (4), the Central Government shall pay to the person transferring or assigning the same, the amount recovered by or on behalf of the Central Government in respect of the goods, after deducting all costs, charges and expenses incurred by the Central Government in selling the goods or in recovering or realizing the amount in respect of such goods.

Without prejudice to the provisions of sub-section(1), where the value of the goods specified in the declaration furnished under that sub-section is less than the amount which in the opinion of the Reserve Bank, in a case falling under sub-clause (i) of clause (a) of that sub-section, represents the full export value of those goods, or in a case falling under sub-clause (ii) of that clause, the value which the exporter can, having regard to the prevailing market conditions, expect to receive on the sale of the goods in the overseas market, the Reserve Bank may issue an order requiring the person holding the shipping documents to retain possession thereof until such time as the exporter of the goods has made arrangements for the Reserve Bank or a person authorized by the Reserve Bank to receive on behalf of the exporter payment in the prescribed manner of an amount which in the opinion of the Reserve Bank represents the full export value of such goods or the value which the exporter, having regard to the prevailing market conditions, can be expected to receive on the sale of the goods in the overseas market.

For the purpose of ensuring compliance with provisions of this section and any order or direction made there under, the Reserve Bank or the prescribed authority referred to in sub-section (1) may require any person making any export of goods to which a notification under clause (a) of that sub-section applies to exhibit contracts with his foreign buyer or other evidence to show that the full export value of the goods, or, as the case may be, the value which the exporter, having regard to the prevailing market conditions, expects to receive on the sale of the goods in the overseas market, has been, or will within the prescribed period be, paid in the prescribed manner.

Without prejudice to the provisions of sub-section (1), where the Reserve Bank has permitted any authorized dealer to accept for negotiation or collection of shipping documents covering exports from his constituent [not being a person who has signed the declaration in terms of sub-section (1)], such authorized dealer shall, before accepting such documents for negotiation or collection, require the constituent concerned also to sign such declaration and thereupon such constituent shall be bound to comply with such requisition and the original declarant and such constituent signing the declaration shall each be considered to be the exporter for the purposes of this section, and shall be governed by the provisions thereof accordingly.

Without prejudice to the provisions of sub-section (1), in relation to export of goods to which a notification under clause (a) of that sub-section applies, the Reserve Bank may, for the purpose of ensuring that the full export value of the goods or, as the case may be, the value which the exporter, having regard to the prevailing market conditions, expects to receive on the sale of the goods in the overseas market, is received in proper time or without delay, by general or special order, direct from time to time, that in respect of export of goods to any destination or any class of export transactions or

any class of goods or class of exporters, the exporter shall, prior to the export of the goods, comply with any or all of the following conditions as may be specified in the order, namely:-

that any contract or other arrangement for the sale of the goods shall be registered in such manner and with such authority or organisation as may be specified in the order;

that the payment for the goods is covered by an irrevocable letter of credit or by such other rrangement or document as may be specified in the order;

that a copy of the declaration to be furnished to the prescribed authority under sub-section(1) shall be submitted to such authority or organisation as may be specified in the order for certifying that the value of the goods specified in such declaration represents the proper value thereof;

that any declaration to be furnished to the prescribed authority under sub-section (1) shall be submitted to the Reserve Bank for its prior approval, which may, having regard to the circumstances, be given or withheld or may be given subject to such conditions as the Reserve Bank may deem fit to impose:

Provided that no approval shall be withheld by the Reserve Bank under this clause unless the exporter has been given a reasonable opportunity for making a representation in the matter.

Where the Central Government is of opinion that, in respect of any goods or class of goods or class of exporters, or in respect of export to any destination, the practice of exporting goods in accordance with any term to the effect that the goods will be sold on account of the exporter and the account of such sales rendered to the exporter has resulted or is likely to result in the full export value of the goods not being brought into India in the prescribed manner or within the prescribed period, it may, by general or special order, prohibit the export, in accordance with such term, of such goods or class of goods or by such exporters or to such destination.

Payment for lease, hire or other arrangement

No person shall, except with the general or special permission of the Reserve Bank, take or send out by land, sea or air any goods from India to any place on lease or hire or under any arrangement other than sale or disposal in any other manner of such goods.

Regulation of export and transfer of securities

Notwithstanding anything contained in section 81 of the Companies Act, 1956, no person shall, except with the general or special permission of the Reserve Bank, --

Take or send any security to any place outside India;

Transfer any security, or create or transfer any interest in a security, to or in favour of a person resident outside India;

Issue, whether in India or elsewhere, any security which is registered or to be registered in India, to a person resident outside India; Acquire, hold or dispose of any foreign security.

Where the holder of a security is a nominee, neither he nor any person through whose agency the exercise of all or any of the holder's rights in respect of the security is controlled shall, except with the general or special permission of the Reserve Bank, do any act, whereby he recognizes or gives effect to the substitution of another person as the person from whom he directly receives instructions, unless both the person previously instructing and the person substituted for that person were, immediately before the substitution, resident in India.

The Reserve Bank may, for the purpose of securing that the provisions of this section are not evaded, require that the person transferring any security and the person to whom such security is transferred shall subscribe to a declaration that the transferee is not resident outside India.

Notwithstanding anything contained in any other law, no person shall, except with the permission of the Reserve Bank, - enter any transfer of securities in any register or book in which securities are registered or inscribed if he has any ground for suspecting that the transfer involves any contravention of the provisions of this section, or enter in any such register or book, in respect of any security whether in connection with the issue or transfer of the security or otherwise, an address outside India except by way of substitution for any such address in the same country or for the purpose of any transaction for which permission has been granted under this section with knowledge that it involves entry of the said address.

Notwithstanding anything contained in any other law, no transfer of any share, bond or debenture of a company registered in India made by a person resident outside India or by a national of a foreign State to another person resident in India shall be valid unless such transfer is confirmed by the Reserve Bank on an application made to it in this behalf by the transferor or the transferee.

If the Reserve Bank is of opinion that it is necessary or expedient in the public interest so to do, it may, by general or special permission exempt any transfer referred to in sub-section (5) or any class of such transfers from the operation of the provisions of that sub-section, subject to such conditions, if any, as may be specified in such permission.

For the purposes of this section -

"holder", in relation to a bearer security, means the person having physical custody of the security; provided that, where a bearer security is deposited with any person in a locked or sealed receptacle from which the person with whom it is deposited is not entitled to remove it without the authority of some other person, that other person shall be deemed to be the holder of the security;

"nominee" means a holder of any security (including a bearer security) or any coupon representing dividends or interest who, as respects the exercise of any rights in respect of the security or coupon, is not entitled to exercise those rights except in accordance with the instructions given by some other person, and a person holding a security or coupon as a nominee shall be deemed to act as nominee for the person who is entitled to give instructions either directly or through the agency of one or more persons, as to the exercise by the holder of the security or coupon of any rights in respect thereof and is not, in so doing, himself under a duty to comply with instructions given by some other person.

Restrictions on issue of bearer securities

Except with the general or special permission of the Reserve Bank, no person shall, in India, and no person resident in India shall, outside India, create or issue any bearer certificate or coupon or so alter any document that it becomes a bearer certificate or coupon.

Restriction on settlement etc.

No person resident in India shall, except with the general or special permission of the Reserve Bank, settle, or make a gift of, any property so that a person who at the time of the settlement or the making of the gift is resident outside India, elsewhere than in the territories notified in this behalf by the Reserve Bank, will have an interest in the property, or exercise any power for payment in favour of a person who at the time of the exercise of the power is resident outside India elsewhere than in such notified territories:

Provided that any settlement or gift made or any power exercised as aforesaid without the permission of the Reserve Bank shall not be invalid merely on the ground that such permission has not been obtained.

Importance of Materials Management

Structure

6.1 Knowledge Management Introduction

- 6.1.1 Organizational Knowledge
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- 6.2.1 Import/Export Procedure
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6.1 KNOWLEDGE MANAGEMENT INTRODUCTION

Knowledge Management is a conscious strategy of getting the right knowledge to the right people at the right time, and helping people share and put knowledge into action for improving the organizational performance. The key concept is 'organizational performance' or 'productivity improvement'. If the usage of computers for productivity improvement can be analyzed, it can be seen that the starting point was basic data processing systems. Data processing systems process transactions and produce reports. It represents the automation of fundamental, routine processing to support operations. For this purpose Electronic Data Processing(EDP) departments were set up in many organizations. The idea of using the information captured in transaction processing system for decision making gave birth to Decision Support Systems(DSS), Management Information Systems(MIS), Enterprise Information Management (EIM) etc, though the contribution from data processing system is minimal . In a similar way is the idea of 'Knowledge Management' has evolved from 'Information Management' ? There are contradicting views on this. In this paper we consider 'Knowledge Management' as different from 'Information Management' and the only similarities are both aids in improving organizational productivity and both use 'Information Technology' like computers , networks etc. Organizational Memory(OM) can be defined as a set of repositories of data, information and knowledge that the organization has acquired and retains over a period of time. Stein and Zwass (1995) define OM as the means where by knowledge from the past is brought to bear on present activities resulting on higher or lower levels of organizational* Electronics and Instrumentation Group, Indira Gandhi Centre for Atomic Research193effectiveness. Walsh and Ungson (1991) define OM as stored information from an organization's history that can be thought to bear as the present decisions. The main goals of OM are to integrate information and knowledge across organizational boundaries, to assist current activities based on past experiences and to avoid repetition of past mistakes. Basic function of OM are perception , acquisition, abstraction, recording, storage, retrieval, interpretation and transmission of organizational knowledge (Stein and Zwass 1995). Walsh and Ungson (1991) propose that organizational memory consist of five retention facilities:
individuals, culture, transformation, structures and ecology. OM consists of unstructured and structured data, information and knowledge, unstructured concepts information and knowledge that exist in the organization's culture and in the minds of the employees can be partially elicited and represented in electronic documents, audio, video recordings etc. Structured concepts, data, information and knowledge that resides in various pockets of the organization can be completely captured and represent by electronic documents, databases etc. From the above discussions it is obvious that OM consists of data, information &knowledge and knowledge management is a subset of organizational memory management. In simple terms Knowledge Management refers to Management of 'Knowledge' similar to Human Resource Management or Materials Management. When the 'Knowledge' refers to 'Personal Knowledge' it is "Personal Knowledge Management"; when it refers to the knowledge of an organization it is "Organizational Knowledge Management"; when it refers to the knowledge of a nation, it is "National Knowledge Management" and so on. However in general and in this paper the term "Knowledge Management" refers to "Organizational Knowledge Management".Knowledge management is a broad subject with many facets. The process and terminology associated with knowledge management appears abstract. Based on the review of the literatures presented by many academics and practitioners, it can be concluded that there is not yet a common consensus on the definition and the concept of knowledge management (Earl, 1999). Defining knowledge management is akin to the old fable of the blind men and the elephant where each

person touches different part of the elephant's body and arrives at their perception of what the elephant looks like and really is (Bonanno, 2003).In a broad sense there are two schools of knowledge management; one centered around explicit knowledge and another one centered around people and tacit knowledge. For the first group knowledge management deals with collecting and codifying the knowledge available in different pockets of the organization and making it available to all the relevant employees of the organization. One of the definitions appropriate for this group is "knowledge management is the process of capturing a company's collective expertise wherever it resides in databases or paper or in peoples heads and distributing it to wherever it can help to produce the biggest pay off" (Hibbard,1997). The researchers and practitioners in this field have their education in information technology and information science. For this group knowledge is a tangible object which can be identified and handled in information systems. For the second group, knowledge management is synonymous with people management, adding a new dimension to traditional human resource management, because they believe that knowledge resides only in the minds of people and what is available explicitly is only information. The researchers in this field have their education in business management, philosophy, psychology, sociology etc. They are primarily involved in assessing and improving human skills and behaviour. For them, knowledge is a process, a complex set of dynamic skills, know how etc., which is constantly changing. Knowledge is the capacity to act and it is synonymous with individual competence (Sveiby, 2001). Based on this, we can define "knowledge management as the one which creates and nurtures the organizational environment where knowledge sharing, creation and growth takes place in the organization as an integral process in every role, on a continuous basis ,thereby improving the dynamic capacity of the employees to act effectively in various situations". Knowledge management initiatives can be classified in to two main types. This classification is based on the way knowledge is shared. One method is 'indirect' by converting the tacit knowledge into explicit knowledge and shared. It is by the process of exernalisation , combination and internalization . This method is also called the codification approach where the strategy is people to document and document to people. The other method is 'direct' where tacit knowledge is shared among people where the strategy is people to people. This method is also called personalization approach. A holistic approach to knowledge management should address both direct and indirect methods.

Knowledge may be explicitly available in the form of reports of activities, minutes of meetings, memoranda, proceedings of conferences, other documents or databases, audio and video recordings, multimedia presentations or implicitly as the experience, emotions, values, hunches and understanding of the people in the organization. Hence Knowledge can be classified in to 'tacit' and 'explicit'. Tacit knowledge resides in the heads of people and explicit knowledge is available in paper, computer etc. Tacit knowledge is what the knower knows, which is derived from experience and embodies beliefs and values. According to Nonanka "explicit knowledge is the knowledge that is easily expressed, captured stored and reused. In contrast, tacit knowledge is highly personal and resides in the minds of people as the experience, emotions, values, hunches and understanding . It is hard to formalize and therefore difficult to communicate to others" (Nonanka, 1991). For Nonanka tacit and explicit knowledge are not separate but mutually complimentary entities. They interact with each other in the creative activities of human beings. Nonanka calls this as the knowledge conversion process. This conversion process consists of socialization, externalization, combination and internalization. Socialization transfers tacit knowledge between individuals through observation, discussion, demonstration etc. Externalization converts the tacit knowledge in to explicit knowledge in the form of documents , video recordings etc. Combination re-configures explicit knowledge through adding, combining, modifying and categorizing. Combination also includes making available the explicit

knowledge to others. Internalization translates explicit knowledge in to tacit knowledge by absorbing the explicit knowledge by individuals. However we use the term 'explicit knowledge' where the knowledge is already available explicitly in the form of documents , audio/ video recordings etc in electronic or non electronic form and the term 'tacit knowledge' where the knowledge still resides in the minds of people in the form of experience, feelings, opinions, intuition etc. We feel that certain percentage of the tacit knowledge can be converted into explicit by suitable knowledge elicitation methods. In this paper the term 'knowledge' is used to refer the combined knowledge available both in explicit and tacit form.

6.1.1 Organizational Knowledge

Organizational Knowledge refers to the combined knowledge of all past and present employees of the organization. In this sense it may not be possible to capture the complete organizational knowledge into accessible repositories , because it involves tacit knowledge and it involves past employees. However we use the term 'Organizational Knowledge' to refer to the combined knowledge of all past and present employees of the organization which are captured into accessible repositories.

Knowledge has often been considered as a resource, strategic asset, and most importantly a source of competitive advantage to organizations. Knowledge unlike other organizational resources like 'men', 'money', 'machines' and 'materials' is difficult to imitate, and strategically difficult to substitute. For a firm to gain a competitive advantage it requires the capability to transform resources, and knowledge provide that ability. Hence in the absence of organizational knowledge, other resources cannot be utilized effectively. Davenport and Prusak (1998) view knowledge as an evolving combination of experiences, expert insights, values, contextual information etc. that provides a frame work for evaluating and incorporating new experiences and information. In other words, organizational knowledge facilitates creation of new knowledge. Nonanka (1991) states that knowledge is context specific and is about the "meaning". This implies that for a knowledge repository to be useful, it must also store the context in which the knowledge was generated. The context specific nature of knowledge implies that 'Knowledge' as it is can not be applied universally but new knowledge applicable for the given context need to be generated from the available knowledge.

6.2.3 Organizational Memory

Organizational Memory is the body of data, information and knowledge relevant to an individual organization's existence. It has two repositories – an organization's record of activities/products , including its electronic data bases, and individuals' memories. The composition of OM includes prior data and information, all internally-generated documentation related to the organizational activities such as intellectual property, details of events, products and individuals, relevant published reference material and – importantly – institution-created knowledge. OM can be visualized as the data, information and knowledge captured by an organization in accessible repositories. These repositories consist of documents, audio, video, people, culture and computers. The effective use of captured data, information and knowledge results in 'learning' by individuals and organization. The effective use is possible only if it can be accessed when required, necessitating effective retrieval systems. It is generally expected that learning will improve organizational effectiveness. But, it is also possible that organizations can learn incorrect behaviors. In order to avoid such a pitfall, the contents of OM, its usage and the resultant performance need to be continuously monitored. The basic components of Organizational Memory System(OMS) are capturing, storing, searching, retrieving, using and

assessing. In other words OM is a subset of OMS. However we use the terms OM and OMS interchangeably.

The simplified representation of an OM is shown in figure 1. The central repository consists of data, information and knowledge created and used by various organizational entities. The organizational entities can be individual employees, team, sections, task force, departments

Organizational Learning

Organizational Learning characterizes how organizations learn from their own and others' experiences. It is also known as Experiential Learning. When it comes to experiential learning, an awareness of both the explicit and tacit components of OM on their own is not generally enough to create new knowledge efficiently. As a general rule it needs to be accompanied by a focused learning phase. Most models of experiential learning are cyclical and have three basic phases: They are awareness of an experience or problem situation, a reflective phase within which the learner examines the OM around the experience and draws bookish learning from that reflection, and a testing phase within which the new insights or learning's, having been integrated with the learner's own conceptual framework, and applied to a new problem situation or experience. The concept's starting point is that individuals or organizations seldom learn from experience unless the experience is assessed and then assigned its own meaning in terms of individual and/or the organization's own goals, aims, ambitions and expectations. From these processes come the insights and added meaning, which is then applied to new circumstances. The end product is better decision-making.

Knowledge Management, which is the process of collecting and disseminating know-how and experiences within an organization, enables the process of Organizational Learning, or Experiential Learning, to take place. Malhotra (1996) defines organizational learning (OL) as the process of detection and correction of errors. Organizations learns through individuals acting as agents for them. Individual learning activities by organizational factors which can be called an organizational learning system. Organizational learning is the process whereby an organization assimilates experiences of its members and uses that experience to modify the organizations potential actions. During work employees gain experience, observe and reflect in making sense out of what they are doing. They analyze these experiences and general abstractions are arrived. They formulate perceptions on better methods of doing work. As these employees influence the co-workers the "organization learns and the work culture is gradually changed". OM is necessary to facilitate the processing and retention of information and knowledge needed for learning to take place. Organizational learning uses OM as its knowledge base.

Functions of OM

The function of OM is to store the captured data, information and knowledge applicable to the organization in accessible repositories. OM is created as a result of individual and organizational activities and learning. Capturing the experience involves capturing the structured explicit knowledge and the unstructured tacit knowledge. Capturing the structured explicit knowledge is relatively easy. It can be captured from documents, reports, publications, work procedures, data processing systems, Information Management Systems etc. Capturing the unstructured, abstract, tacit knowledge though difficult is important for the OM. For this individuals act as the agents of capturing the knowledge as they synthesize it in to their own internal knowledge base and apply to actions such as changing procedures and work processes. The context and reasoning of such changes can be captured and stored in OM. In addition to this limited capture of tacit knowledge, individuals themselves are the main

source of tacit knowledge. As the data, information and knowledge stored in OM are applied over time, the organizational culture changes to reflect its use. Cultural change of organization takes time, because organizational members need to reach a consensus that the anticipated changes in organizational actions, norms and values are appropriate, acceptable and beneficial to the organization. Consensus making is time consuming.

Management of OMS

The management of OMS consists of planning, identifying, capturing, quality controlling, storing, searching, retrieving, and using the data, information & knowledge relevant to the organization. Monitoring the benefits to the individuals and to the whole organization is also a part of the management of OMS. It is possible to automate the capture of certain data, information and knowledge in to the organizational memory. However, it is also necessary to capture the relevant knowledge manually, codify and store in the OM. The usage and benefit of OMS should be monitored. The OMS subsystems which are effective in improving the organizational performance should be maintained and expanded and others which are not effective should be analyzed and made effective or dropped.

Approaches to build OMS

There are two approaches to building an OMS. They are process based approach and infrastructure based approach. The process based approach focuses on the area of OM by participants in a process, task or project in order to improve their effectiveness. This approach identifies the data, information and knowledge needs of the process and its users, capture them and store in OM. It has well defined users and hence it is user centric. The infrastructure based approach focuses on building a base system to capture, store and distribute OM for use throughout the organization. It is more concerned with the technical details associated with identification, storage, search, retrieval and use of OM. The approach focuses on network capacity, database, information and knowledge classification etc. The approach is technology centric and takes longer time for visible success. Combination of both approaches need to be used to create organization wide OM. Since, the process based approach supports specific process and projects and identified users and knowledge requirements. The infrastructure based approach integrates all OM in to a single system and hence provides higher benefits, since it is spread across the entire organization rather than a few process. The process based approach is more suitable for small organizations with well defined OM goals. The infrastructure approach is preferred for large organizations, where the OM needs are not known, but the organization knows that OM is necessary. Studies of different OM implementations (Ackerman, 1994) reveals that, the success rate of process based OM is high compared to infrastructure based organization wide OM. Hence, it is suggested that even in infrastructure based organization wide OM, it is preferable to break OM into manageable pieces, that correspond to specific process, task, project or department and integration of these smaller pieces to form the overall OM. This hybrid approach of having an overall plan of infrastructure based OM, identifying the components as process based OM and finally integrating to form the complete organization wide OM has the dual benefits of infrastructure based approach and process based approach.

Design of OMS

The basic components of OMS are capturing, storing, searching, retrieving, using and assessing OM. The issues affecting the design of OMS are perspective of OM from different organizational groups,

information overload, quality control and security of OM, capturing mechanism , storing, retrieval, usage and integration of memory components. OM repositories need to be designed to accommodate different types of data like meta data, structured data, semi structured data and unstructured data. Organization and representation of memory and the user interfaces are the keys to success of OMS. Effective memory maps need to be designed based on the user requirements. Capture of certain memory can be done automatically from transaction processing system. However it is also required to capture manually by designated personnel. The content in OM ages with time and need to be purged when it is no longer required. Methods for identifying and purging outdated memory, like validity period and automatic/ administrator controlled purging after the validity period etc. need to be evolved. Design of OMS should also consider the technology infrastructure like network, servers, storage, back up devices etc. A typical OMS applicable for a large Research and Development Organization is depicted in figure 2.

System Quality
Information Quality
Individual
Impact
Organizational
Impact
Use
User
Satisfaction
Figure 3. IS Success Model

The organization has various transaction processing systems like Human Resource Management System, Finance, Projects, Procurement and Materials Management etc. The relevant data and information from these systems can be captured in to the OM through proper quality control and filtering mechanism. Similarly the relevant data from Scientific Data Warehouse and Digital Library can be brought into the OM. Also information and knowledge available in various Departments need to be consciously captured into the OM. The performance of OM can be monitored through user feed back and performance measurement methods. The mechanism of purging like validity period, 'no usage' etc. can be used.

6.1.3 Organizational Memory Systems

When an Organization has implemented OMS, the effectiveness need to be measured and the design of OMS should include appropriate methods to measure it. However, it is also necessary to predict the effectiveness by appropriate methods even before the implementation. Organizational effectiveness can be described using the competing values model (Stein and Zwass, 1995, Quinn and Rhorbaugh, 1983). This model assumes that organizational effectiveness is related to OMS. It uses four organizational effectiveness criteria: integration, adaptation, goal attainment and pattern maintenance. The integration

function is the technology capability for providing access to the OM which may be distributed across the entire organization in space and time. The adaptive function is the ability of the organization to adapt to the changes in the organization. The goal attainment function is the ability of the organization to set goals and evaluate the degree of their fulfillment. The pattern maintenance function is the ability of the organization to maintain the cohesion and the morale of the human resource. The competing values model, though predicts the effectiveness of OMS, through the organizational effectiveness

variables, it does not predict the usage of OMS. The generalized assessment of OMS success can be predicted by adapting the Information System Success Model which (Jennex Adolfman, 2002, Delone and McLean's 1992) depicted in Figure 2. 200

The 'System Quality' refers to the technological characteristics of the OMS. This includes the capability of the organization to develop and maintain OMS in terms of quality human resource(developers and users) and advanced hardware & software. It also includes the level of integration : how much of the accessible memory is online and available through a single interface. In addition it includes the quality of search and retrieval functions. The 'Information Quality' defines the quality of the memory content in terms of its richness, the linkages and to the extent to which it meets the needs of the users on a long terms basis. The 'use' refers to the utilization of the outputs of the system and can be used to measure the success of the system when the usage of the system is voluntary. 'User satisfaction' measures the users' perception of the system. Use and user satisfaction will influence each other. The usage of OMS by an individual will produce an impact on his / her performance in the work place. Each individual impact will in turn have an impact on the performance of the Organization, though it may not be a simple addition.

Managing Organizations Memory

It is usually perceived that an organization will benefit from using OM. However, it does not happen always. The Organizational benefit depends on the context in which OM is used. For example, if in a situation where a non routine response was required, the usage of OM resulted in a routine decision, organizational performance deteriorates. Hence, effective management of OM is necessary for improved organizational performance. Also management actions are required for creation and implementation of OM Policies, Procedures and Standards, ensure adequate resources to develop and maintain OM, monitoring the usage of OM and ensure its effectiveness, adequate training to users ,

encourage the OM usage and orient the organizational culture to facilitate the effective growth and usage of OM. The growth and usage of OM is tightly linked to the organizational culture that promotes sharing between organizational members. Sharing culture can be promoted through management support and by reward system used by the organization to assess individual performance. Changing Organizational culture is time consuming and the management need to make available the time and other resources required for this change management.

CONCLUSION

Organizational knowledge is the combined knowledge of all employees both in explicit and tacit form. Organizational Memory is the repository of data, information and knowledge about the past events & activities in an organization and that possessed by various organizational entities. It is applied to decision making regarding future events & activities. OMS are systems built to support the capture and application of OM. In general, it is perceived that application of OM will result in improved organizational performance.

However, it is not ensured unless the management of OMS are effective. Management of OMS need to have strategy to identify the content and application of OM. It is also required to monitor the usage of OM and its impact on Organization's performance.

6.2 IMPORT AND EXPORT DOCUMENTATION

Goods are imported in India or exported from India through sea, air or land. Goods can come through post parcel or as baggage with passengers. Procedures naturally vary depending on mode of import or export. Procedures discussed in this Chapter are applicable for imports by sea, air or land, but not as baggage or postal dispatch.

COMPUTERISATION OF CUSTOMS WORK - Work of customs at Delhi airport has been computerized. Work at Mumbai port is also computerized. Whenever the work is computerized, documents like IGM and Bill of Entry have to be filed electronically. Procedure in computerized environment has been specified in CC, New Delhi PN 22/98 dated 8.5.1998. Guidelines for preparing data file for Bill of Entry and shipping bills for Mumbai Customs House has been prescribed vide PN 108/99 dated 30-9-1999 and PN 10/2001 dated 30.1.2001.

ENTRY – 'Entry' in relation to goods means an entry made in a Bill of Entry, Shipping Bill or Bill of Export. It includes (a) label or declaration accompanying the goods which contains description, quantity and value of the goods, in case of postal articles u/s 82 (b) Entry to be made in case of goods to be exported (c) Entry in respect of goods imported which are not accompanied by label or declaration made as per provisions of section 84. [section 2(16)].

AMENDMENT TO DOCUMENTS - Importer, exporter or 'Person In charge' have to submit various documents to customs authorities like Bill of Entry, Import Manifest, Export Manifest etc. Some times, it may become necessary to amend the document due to various reasons like change in classification, clerical mistake in document, change in unloading / loading plan of vessel etc. In such case, permission to amend these documents have to be obtained from customs authorities. [section 149]. Such permission can be given if there are no fraudulent intentions.

In case of bill of entry, shipping bill or bill of export, it can be amended after clearance only on the basis of documentary evidence which was in existence at the time the goods were cleared, warehoused or exported, and not on basis of any subsequent document. [proviso to section 149].

Customs Station - Imported goods are permitted to be unloaded only at specified places. Similarly, goods can be exported only from specified area. In view of this, definitions of 'Customs Station' is important.

Customs area means all area of Customs Station and includes any area where imported goods or export goods are ordinarily kept pending clearance by Customs authorities. Thus, 'Customs Area' could include some area even outside the 'Customs Station'. Customs Station means (*a*) customs port (*b*) inland container depot (*c*) customs airport and (*d*) land customs station.

Section 7 of Customs Act empowers CBEC (Board) to appoint * Customs ports * Customs airports * Places for inland container depots * Coastal ports. These are appointed by issuing a notification. Section 8 authorizes Commissioner of Customs to approve proper places in any customs port, customs airport or costal port for unloading and loading of goods or for any class of goods and specify the limits of customs area. Thus, the place (city / town / village etc.) is approved by CBEC, while exact location within that city / town / village is approved by Commissioner of Customs.

6.2.1 Import/Export Procedures

Procedures have to be followed by 'person-in-charge of conveyance' as well as the importer.

WHO IS 'PERSON IN CHARGE' - As per section 2(31), 'person in charge' means (a) In case of vessel - its master (b) In case of aircraft - its commander or pilot-in-charge (c) In case of train - its conductor or guard and (d) In case of vehicle or other conveyance - its driver or other person in charge.

The significance of this definition is –

- He is responsible for submitting Import Manifest and Export Manifest
- He is responsible to ensure that the conveyance comes through approved route and lands at approved place only.
- He has to ensure that goods are unloaded after written order, at proper place. Loading also has to be only after permission.
- He has to ensure that conveyance does not leave without written order of Customs authorities.
- He can be penalized for (a) Giving false declaration and statement (b) shortages or non-accounting of goods in conveyance

Procedure to be followed by the Carrier - The 'person in charge of conveyance' (carrier of goods) has to follow prescribed procedure.

Arrival at customs port/airport only - Section 29 provides that person-in-charge of a vessel or an aircraft entering India shall call or land at customs port or customs airport *only*. It can land at other place only if compelled by accident, stress of weather or other unavoidable cause. In such case, he should report to nearest police station or Customs Officer. While arriving by land route, the vehicle should come by approved route to 'land customs station' only.

Import Manifest / Report- Person-in-charge of vessel, aircraft or vehicle has to submit Import Manifest / Report. [also termed as IGM - Import General Manifest]. (In case of a vessel or aircraft, it is called import manifest, while in case of vehicle, it is called import report.) The import manifest in case of vessel or aircraft is required to be submitted *prior* to arrival of a vessel or aircraft. Import report (in case of vehicle) has to be submitted within 12 hours of arrival at the customs station. If the report / manifest could not be submitted within prescribed time, person-in-charge or any person specified as responsible by a notification is liable to penalty upto Rs 50,000. Such penalty will not be imposed if the excise officer is satisfied that there was sufficient cause for the delay. [section 30(1)].

IGM can be submitted electronically through floppy where EDI facility is available.

IMPORT MANIFEST IS REQUIRED TO BE SUBMITTED BEFORE ARRIVAL OF AIRCRAFT OR VESSEL - Section 30(1) of Customs Act provides that Import Manifest should be filed before arrival of ship or aircraft. Normally, the Agents submit the Import Manifest before arrival, so that maximum possible formalities are completed before vessel or aircraft arrives. This also enables importers to file 'Bill of Entry' in advance.

Grant of Entry Inwards by Customs Officer - Unloading of cargo can start only after Customs Officer grant 'Entry Inwards'. Such entry inwards can be granted only when berthing accommodation is granted to a vessel. If there is heavy congestion at port, shipping berth may not be available and in such case, 'Entry Inwards' cannot be granted. This date is highly relevant for determining rate of customs duty applicable.

Carrier responsible for shortages during unloading - If the goods are short landed, the carrier is liable to pay penalty up to twice the amount of duty payable on such short landed goods. It has been held that tally sheet prepared by Port Trust authorities on unloading of goods is a statutory document and should

be accepted in preference to steamer survey - *Scindia Steam Navigation* v. *CC* - 1988 (33) ELT (CEGAT) followed in *re India Steamship Co. Ltd.* - 1992 (57) ELT 510 (GOI).

Procedure by Importer - The importer importing the goods has to follow prescribed procedures for import by ship/air/road. (There is separate procedure for goods imported as a baggage or by post.)

Bill of Entry - This is a very vital and important document which every importer has to submit under section 46. The Bill of Entry should be in prescribed form. The standard size of Bill of Entry is 16" × 13". However, for computerization purposes, 15" × 12" size is permitted. (Mumbai Customs Public Notice No. 142/93 dated 3-11-93).

Bill of Entry should be submitted in quadruplicate – original and duplicate for customs, triplicate for the importer and fourth copy is meant for bank for making remittances.

Under EDI system, Bill of Entry is actually printed on computer in triplicate only after 'out of charge' order is given. Duplicate copy is given to importer.

Types of Bill of Entry - Bills of Entry should be of one of three types. Out of these, two types are for clearance from customs while third is for clearance from warehouse.

BILL OF ENTRY FOR HOME CONSUMPTION - This form, called 'Bill of Entry for Home Consumption', is used when the imported goods are to be cleared on payment of full duty. *Home consumption means use within India*. It is white colored and hence often called 'white bill of entry'.

BILL OF ENTRY FOR WAREHOUSING - If the imported goods are not required immediately, importer may like to store the goods in a warehouse without payment of duty under a bond and then clear from warehouse when required on payment of duty. This will enable him to defer payment of customs duty till goods are actually required by him. This Bill of Entry is printed on yellow paper and often called 'Yellow Bill of Entry'. It is also called 'Into Bond Bill of Entry' as bond is executed for transfer of goods in warehouse without payment of duty.

BILL OF ENTRY FOR EX-BOND CLEARANCE - The third type is for Ex-Bond clearance. This is used for clearance from the warehouse on payment of duty and is printed on green paper. The goods are classified and value is assessed at the time of clearance from customs port. Thus, value and classification is not required to be determined in this bill of entry. The columns in this bill of entry are similar to other bills of entry. However, declaration by importer is not required as the goods are already assessed.

RATE OF DUTY FOR CLEARANCE FROM WAREHOUSE - It may be noted that rate of duty applicable is as prevalent on date of removal *from warehouse*. Thus, if rate has changed after goods are cleared from customs port, customs duty as assessed on yellow bill of entry and as paid on green bill of entry will not be same.

Mention of BIN on Bill of Entry – A BIN (Business Identification Number) is allotted to each importer and exporter w.e.f.. 1.4.2001. It is a 15 digit code based on PAN of Income Tax (PAN is a 10 digit code). [Earlier an EC (Import Export code) number issued by DGFT was required to be mentioned on Bill of Entry].

Filing of Bill of Entry - Normally, Bill of Entry is filed by CHA on behalf of the importer. Customs work at some ports has been computerized. In that case, the Bill of Entry has to be filed electronically, i.e. through Customs EDI system through computerization of work. Procedure for the same has been prescribed vide Bill of Entry (Electronic Declaration) Regulations, 1995.

Documents to be submitted by Importer - Documents required by customs authorities are required to be submitted to enable them to (*a*) check the goods (*b*) decide value and classification of goods and (*c*) to ensure that the import is legally permitted. *The documents that are essentially required are* : (i) Invoice (ii) Packing List (iii) Bill of Lading / Delivery Order (iv) GATT declaration form duly filled in (v) Importers / CHAs declaration duly signed (vi) Import License or attested photocopy when clearance is under license (vii) Letter of Credit / Bank Draft wherever necessary (vii) Insurance memo or insurance policy (viii) Industrial License if required (ix) Certificate of country of origin, if preferential rate is claimed. (x) Technical literature. (xi) Test report in case of chemicals (xii) Advance License / DEPB in original, where applicable (xiii) Split up of value of spares, components and machinery (xiv) No commission declaration. – A declaration in prescribed form about correctness of information should be submitted. – *Chapter 3 Para 6 and 7 of CBE&C's Customs Manual, 2001*.

The Noting is now done electronically in large ports, while it is done manually in small ports. Thoka Number (Serial Number) is given while noting the Bill of Entry.

Electronic submission under EDI system – Where EDI system is implemented, formal submission of Bill of Entry is not required, as it is generated in computer system. Importer should submit declaration in electronic format to 'Service Centre'. A signed paper copy of declaration for non-reputability should be submitted. Bill of Entry number is generated by system which is endorsed on printed check list. Original documents are to be submitted only at the stage of examination.

Assessment of Duty and Clearance

The documents submitted by importer are checked and assessed by Customs authorities and then goods are cleared. Section 2(2) defines 'assessment' as follows – 'Assessment' includes provisional assessment, reassessment and any order of assessment in which the duty assessed is Nil. Thus, 'assessment' includes 'Nil' assessment.

Noting of Bill of Entry - Bill of Entry submitted by importer or Customs House Agent is cross-checked with 'Import Manifest' submitted by person in charge of vessel / carrier. It is noted if the description tallies. 'Noting' really means taking on record by customs officer. This date is relevant for determining rate of customs duty. Thoka number (serial number) is given in the import section. Otherwise, it is returned for clarifications. In case of EDI system, noting is done by the system itself which also generates bill of entry number.

not available for physical verification, proper accountable in books should be maintained. Unit intending to import software through data link is required to inform Date of presentation of bill of entry is highly relevant and the rate of duty as applicable on this date will be considered for calculating the duty payable. Bill of Entry is accepted only after proper scrutiny *vis-à-vis* import manifest and various declarations given in bill of entry and attached documents like invoice, bill of lading etc. If such documents are not attached, the authorities can refuse to accept the Bill of Entry, and hence submission of such incomplete Bill of Entry cannot be taken as date of presentation of Bill of Entry - *Simla Agencies* v. *CC* - 1993 (63) ELT 248 (CEGAT).

Prior Entry of Bill of Entry - After the goods are unloaded, these have to be cleared within stipulated time - usually three working days. If these are not so removed, demurrage is charged by port trust/airport authorities, which is very high. Hence, importer wants to complete as many formalities as possible before ship arrives. Proviso to Section 46(3) of Customs Act allows importer to present bill of entry upto 30 days before *expected date of arrival* of vessel. In such case, duty will be payable at the rate applicable on the date on which 'Entry Inward' is granted to vessel and not the date of presentation

of Bill of Entry, *but rate of exchange will be as prevalent on date of submission of bill of entry*. - confirmed in CC, New Delhi circular No 64/96 dated 10.12.1996 and CBE&C circular No 22/97-Cus dated 4.7.1997.

6.2.2 Assessment of Customs duty and Clearance

Section 17 provides that assessment of goods will be made after Bill of Entry is filed. Date stamp of receipt is put on the 'Bill of Entry' and then it is sent to appraising department either manually or electronically

There are various Appraising groups for different Chapter headings. Each group is under an Assistant/Deputy Commissioner. Group consists of 'Examiners' and 'Appraisers'.

APPRAISING THE GOODS - Appraiser has to (*a*) correctly classify the goods (*b*) decide the Value for purpose of Customs duty (*c*) find out rate of duty applicable as per any exemption notification and (*d*) verify that goods are not imported in violation of any law. He can call for any further documents that may be required for assessment. If he is of the opinion that goods have to be examined for appraisal, he will issue an examination order, usually on the reverse of Bill of Entry. If such order is issued, the Bill of Entry is presented to appraising staff at docks / air cargo complexes, where the goods are examined in presence of importer's representative. Assessment is finalized after getting the report of examination. – *Chapter 3 Para 11 and 12 of CBE&C's Customs Manual, 2001*.

VALUATION OF GOODS - As per rule 10 of Customs Valuation Rules, the importer has to file declaration about full 'value' of goods. If the assessing officer has doubts about the truth and accuracy of 'value' as declared, he can ask importer to submit further information, details and documents. If the doubt persists, the assessing officer can reject the value declared by importer. [rule 10A(1) of Customs Valuation Rules]. If the importer requests, the assessing officer has to give reasons for doubting the value declared by importer. [rule 10A(2)]. If the value declared by importer is rejected, the assessing officer can value imported goods on other basis e.g. value of identical goods, value of similar goods etc. as provided in Customs Valuation Rules. [This amendment has been made w.e.f.. 19.2.98, as per WTO agreement. However, it has been held that burden of proof of under valuation is on department]. - Assessing Officer should not arbitrarily reject the declared value and increase the assessable value. He should follow due process of law and issue appeasable order. – MF(DR) circular No. 16/2003-Cus dated 17-3-2003.

APPROVAL OF ASSESSMENT - The assessment has to be approved by Assistant Commissioner, if the value is more than Rs one lakh. (in cases covered under 'fast track clearance for imports', appraiser is also authorized to approve valuation). After the approval, duty payable is typed by a "pin-point typewriter" so that it cannot be tampered with. As per CBE&C circular No. 10/98-Cus dated 11-2-1998, Assessing Officer should sign in full in Bill of Entry followed by his name, preferably by rubber stamp.

EDI ASSESSMENT – In the EDI system, the cargo declaration is transferred to assessing officer in the groups electronically. Processing is done on the screen itself. All calculations are done by the system itself. If assessing officer needs clarification, he can raise a query. The query is printed at service centre and importer replies through service centre. Facility of tele-enquiry about status of documents is provided in major customs stations. Under EDI, normally, documents are inspected only after assessment. After assessment, copy of Bill of Entry is printed at service centre. Final Bill of Entry is printed only after 'Out of Charge' order is given by customs officer. – *Chapter 3 Para 18 to 22 of CBE&C's Customs Manual, 2001*.

PAYMENT OF CUSTOMS DUTY - After assessment of duty, necessary duty is paid. Regular importers and Custom House Agents keep current account with Customs department. The duty can be debited to such current account, or it can be paid in cash/DD through TR-6 challan in designated banks.

After payment of duty, if goods were already examined, delivery of goods can be taken from custodians (port trust) after paying their dues. If goods were not examined before assessment, these have to be submitted for examination in import shed to the examining staff. After shed appraiser gives 'out of charge' order, delivery of goods can be taken from custodian.

First and second system of assessment - There are two systems of assessment. Section 17(2) provides for assessment after examination of goods and section 17(4) provides for assessment on basis of documents, followed by inspection and testing of goods.

"*First appraisement system*" or '*first check procedure*' is followed if the appraiser is not able to make assessment on the basis of documents submitted and deems that inspection is necessary. Goods are examined first and then these are assessed. This method is followed only if assessment is not possible on basis of documents. - - The importer himself may also request 'first check procedure', if he cannot give all required details regarding description / value of goods. He has to make request for first check examination at the time of filing of Bill of Entry or at data entry stage in case of EDI. He has to give reason for seeking first appraisement. The examination order is recorded on Bill of Entry and then returned to importer / CHA. It is then presented to import shed for examination. The shed appraiser / Dock examiner examines the goods as per examination order and records his findings. If samples are required, they are taken out. In case of EDI system, the report of examination is given in the computer itself. The goods are then assessed to duty by appraiser. - *Chapter 3 Para 23 of CBE&C's Customs Manual, 2001.*

In "*Second Appraisement System*" or '*second check procedur*e', which is normally followed, assessment is done on basis of documents and then goods are examined. Such examination is not mandatory. It is done on selective basis on the basis of 'risk assessment' or specific intelligence report. Section 17(4) of Customs Act specifically provides that if initially assessment is done on basis of documents, re-assessment can be done after examination or testing of goods or otherwise, if it is found subsequent to examination or testing or otherwise, that any statement made on Bill of Entry or any information supplied is not true in respect of matter relevant to assessment of duty.

First appraisement is generally carried out in following cases - * If complete documents are not submitted * Goods are to be tested for correct classification * Goods are re-imported * Goods are damaged or deteriorated and abatement is claimed * Goods are abandoned and remission of duty is applied for * When goods are provisionally assessed * When importer himself requests for examination of goods before payment of duty.

EXAMINATION OF GOODS - Examiners carry out physical examination and quantitative checking like weighing, measuring etc. Selected packages are opened and examined on sample basis in 'Customs Examination Yard'. Examination report is prepared by the examiner.

Accelerated Clearance of Imports and Exports Scheme (ACS) – Finance Minister, in his budget speech on 28-2-2003, had announced a 'self assessment scheme' for importers and exporters. As per the scheme, importer will himself determine classification of goods including claim for exemption benefits. Computer System will calculate the duty based on his declaration. Physical inspection of imported goods will be done by risk-assessment and management techniques on a computer based

system and not on the orders of customs examining staff. Audit of import documents will not be by existing system of concurrent audit but will be done by post-clearance audit, as prevalent in developed countries.

Subsequently, a Accelerated Clearance of Import and Export Scheme (ACS) has been announced vide MF(DR) circular No. 30/2003-Cus dated 4-4-2003. The scheme is announced through administrative instructions, without making any change in statutory provisions. Hence, the scheme is not same as 'self removal' under Central Excise. Presently, the scheme is introduced on trial basis at Air Customs, Sahar (Mumbai), ICD, New Delhi and Chennai Sea Customs.

In case of imports, the scheme will be open to all status holders under EXIM policy, Central and State Government PSUs and other importers who have been importing for at least two years and have filed at least 25 Bills of Entry in preceding year. - - In case of exports, the scheme will be open to all status holders under EXIM policy, EOU/STP/EHTP units whose goods have been sealed in presence of customs/excise officers, Central and State Government PSUs, manufacturer-exporters who have been exporting for at least two years and have filed at least 25 Shipping Bills in preceding year and bulk exporters. - - Certain sensitive items have been excluded from the provisions. Importer/exporter intending to avail this facility has to make application to Commissioner. The clearances will be subject to post clearance audit.

Provisional Assessment - Section 18 of Customs Act, 1962 provide that provisional assessment can be done in following cases (*a*) when Customs Officer is satisfied that importer or exporter is unable to produce document or furnish information required for assessment (*b*) it is deemed necessary to carry out chemical or other tests of goods (*c*) when importer/exporter has produced all documents, but Customs Officer still deems it necessary to make further enquiry. In such cases, assessment is done on provisional basis. The importer/exporter has to furnish guarantee/security as required by Customs Officer for payment of difference if any. Goods can be cleared after payment of duty provisionally assessed and after providing the security. After final assessment, difference is paid by importer or refunded to him as the case may be. If the imported goods were warehoused after provisional assessment, the Customs Officer may require importer to execute a bond for twice the difference in duty, if duty finally assessed is higher [section 18(2)(*a*)]. The bond is called as 'P D Bond' (Provisional Duty Bond). The bond is with security or surety. Bank guarantee can also be given as a security.

Checking of duty drawback / license documents - Documents in respect of Duty Entitlement Pass Book (DEPB), advance license, duty drawback etc. will be checked.

6.2.3 Execution Of Bond And Payment Of Duty

Once the duty is assessed, the bill of entry is returned to importer. The Bill of Entry should be presented to computer's for calculation and pinpointing of the duty. If bond has to be executed, it will be taken in bond section.

Payment of duty - If goods are to be removed to a warehouse, duty payment is not required. The goods can be taken to a warehouse under bond, without payment of duty. However, if goods are to be removed for home consumption, payment of customs duty is required. CHA or the importer can take it for payment of customs duty. Large importers and CHA have P.D. accounts with customs. Duty can be paid either in cash or through P.D. account. P. D. account means provisional duty account. This is a current account, similar to PLA in central excise. The importer or CHA pays lump sum amount in the account and gets credit on the amount paid. He can pay customs duty by debiting the amount in P.D. (Provisional Duty) account. If the importer does not have an account, he can pay duty by cash using TR-6 challan. Of course, payment through PD account is very convenient and quick.

The duty should be paid within five working days (i.e. within five days excluding holidays) after the 'Bill of Entry' is returned to the importer for payment of duty. [section 47(2)]. (Till 11-5-2002, the period allowed was only 2 days).

Interest for late payment - If duty is not paid within 5 working days as aforesaid, interest is payable. Such interest can be between 10% to 36% as may be notified by Central Government. [Section 47(2) of Customs Act, 1962.]. - - Interest rate is 15% w.e.f.. 13-5-2002. [Notification No. 28/2002-Cus(NT) dated 13-5-2002] Earlier, interest rate was 24% p.a, w.e.f.. 1-3-2000, as per notification No. 34/2000-Cus(NT)].

Disposal if goods are not cleared within 30 days - As per section 48 of Customs Act, goods must be cleared within 30 days after unloading. Customs Officer can grant extension. Otherwise, goods can be sold after giving notice to importer. However, animals, perishable goods and hazardous goods can be sold any time - even before 30 days. Arms & ammunition can be sold only with permission of Central Government.

Out of Customs Charge Order - After goods are examined, it is verified that import is not prohibited and after customs duty is paid, Customs Officer will issue 'Out of Customs Charge' order under section 47. Goods can be cleared from customs area only on receipt of such order. This is an 'adjudicating order' within the meaning of Customs Act, even if it is passed by Appraiser and not by Assistant Commissioner.

Demurrage if goods not cleared - Heavy demurrage is payable if goods are not cleared from port within three days.

Import of software through data communication - Import of software through data communication / tele-communication is permitted. Since such imports are estimated annual requirement to Development Commissioner of EOU / Director of STP. This should be approved by him. [what for ?]. After import of software through internet, written information should be submitted to Director of STP / Development Commissioner of EOU and importer shall get a certificate. This certificate should be submitted to Assistant / Dy Commissioner of Customs within 48 hours, along with Bill of Entry and certificate from Development Commissioner of EOU / Director of STP. He will issue 'out of charge'

order. The documents such as invoice etc. will be routed through bank. - MF(DR) circular No. 58/2000-Cus dated 10-7-2000.

Relevant Date for Rate and Valuation of Customs Duty - Section 15 of Customs Act prescribes that rate of duty and tariff valuation applicable to imported goods shall be the rate and valuation in force at one of the following dates. (*a*) if the goods are entered for home consumption, the date on which bill of entry is presented (*b*) in case of warehoused goods, when Bill of Entry for home consumption is presented u/s 68 for clearance from warehouse and (*c*) in other cases, date of payment of duty.

CONCEPT OF TERRITORIAL WATERS NOT RELEVANT - It may be noted that concept of ' date of entering into territorial waters' is not relevant for purposes of determination of rate of customs duty.

Export Procedures

Procedures have to be followed by (*a*) 'person-in-charge of conveyance' and (*b*) the exporter. The procedures are similar to procedures for import, of course, in reverse direction.

NO STOPPAGE OF EXPORT CONSIGNMENT - Exports are vital for our economy. Any stoppage in export consignment means loss of export orders to the exporter and loss of foreign exchange to the country. Hence, it has been provided that movement of export consignment will not be interrupted and no export consignment shall be withheld for any reason whatsoever. In case of any doubt, customs authorities may ask for an undertaking that the export is on sole responsibility of the exporter. [Highlights of EXIM policy 1997-2002 as amended on 13.4.1998].

Procedures by person in charge of conveyance – Any new airline, shipping line, steamer agent should be registered in Customs Systems for electronic processing of shipping bills etc.

The 'person in charge of conveyance' has to follow prescribed procedures.

Entry Outward - The vessel should be granted 'Entry Outward'. Loading can start only after entry outward is granted. (section 39 of Customs Act). Steamer Agents can file 'application for entry outwards' 14 days in advance so that intending exporters can start submitting 'Shipping Bills'. This ensures that formalities are completed as quickly as possible and loading in ship starts quickly.

LOADING WITH PERMISSION - Export goods can be loaded only after Shipping Bill or Bill of Export, duly passed by Customs Officer is handed over by Exporter to the person-in-charge of conveyance. In case of baggage and mail bags, shipping bill is not necessary, but permission of Customs Officer is required (section 40).

Export Manifest - As per section 41, an Export Manifest/Export Report in prescribed form should be submitted before departure. [The report is popularly called as 'Export General Manifest' - EGM]. The details required are similar to import manifest. Such manifest/report can be amended or supplemented with permission, if there was no fraudulent intention. Such report should be declared as true by the person-in-charge signing the export manifest. This report is not required if the conveyance is carrying only luggage of occupants.

6.2.4 Procedures To Be Followed By Exporter

Export procedures have been summarized in Chapter 3 Part II of CBE&C's Customs Manual, 2001.

Every exporter should take following initial steps—

- Obtain BIN (Business Identification Number) from DGFT. It is a PAN based number
- Open current account with designated bank for credit of duty drawback claims
- Register licenses / advance license / DEPB etc. at the customs station, if exports are under Export Promotion Schemes

Exporter has to submit 'shipping bill' for export by sea or air and 'bill of export' for export by road. Goods have to be assessed for duty, even if no duty is payable for most of exports, as 'Nil Duty' assessment is also an assessment.

Shipping Bill to be submitted by Exporter - Shipping Bill and Bill of Export Regulations prescribe form of shipping bills. It should be submitted in quadruplicate. If drawback claim is to be made, one additional copy should be submitted. There are five forms : (*a*) Shipping Bill for export of goods under claim for duty drawback - these should be in Green color (*b*) Shipping Bill for export of dutiable goods - this should be yellow color (*c*) shipping bill for export of duty free goods - it should be white color (*d*) shipping bill for export of duty free goods ex-bond - i.e. from bonded store room - it should be pink color (e) Shipping Bill for export under DEPB scheme - Blue color.

The shipping bill form requires details like name of exporter, consignee, Invoice Number, details of packing, description of goods, quantity, FOB Value etc. Appropriate form of shipping bill should be used.

Relevant documents i.e. copies of packing list, invoices, export contract, letter of credit etc. are also to be submitted. In case of excisable goods, from ARE-1 prepared at the time of clearance from factory should also be submitted.

Customs authorities give serial number (called *'Thoka Number'*) to shipping bill, when it is presented.

Excise formalities at the time of Export - If the goods are cleared by manufacturer for export, the goods are accompanied by ARE-1 (earlier AR-4). This form should be submitted to customs authorities. The Customs Officer certifies that the goods under this form have indeed been exported. This form has then to be submitted to Maritime Commissioner for obtaining 'proof of export'. The bond executed by Manufacturer-exporter with excise authorities is released only when 'proof of export' is accepted by Maritime Commissioner or Assistant Commissioner, where bond was executed.

Duty drawback formalities - If the exporter intends to claim duty drawback on his exports, he has to follow prescribed procedures and submit necessary papers. The procedures are discussed in the chapter on 'Export Incentives'. He has to make endorsement of shipping bill that claim for duty drawback is being made. If he fails to do so due to genuine reasons, Commissioner of Customs can grant exemption from this provision. [proviso to rule 12(1)(a) of Duty Drawback Rules].

G R / SDF / SOFTEX Form under FEMA - Reserve Bank of India has prescribed GR / SDF form under FEMA. "G R" stands for 'Guaranteed Receipt' form, while SDF stands for 'Statutory Declaration Form'). SDF form is to be used where shipping bills are processed electronically in customs house, while GR form is used when shipping bills are processed manually in customs house.

Other documents required for export - Exporter also has to prepare other documents like (*a*) Four copies of Commercial Invoice (*b*) Four copies of Packing List (*c*) Certificate of Origin or pre-shipment inspection where required (*d*) Insurance policy. (e) Letter of Credit (f) Declaration of Value (g) Excise ARE-1/ARE-2 form as applicable (h) GR / SDF form prescribed by RBI in duplicate (i) Letter showing BIN Number.

RCMC certificate from Export Promotion Council - Various Export Promotion Councils have been set up to promote and develop exports. (e.g. Engineering Export Promotion Council, Apparel Export Promotion Council, etc.) Exporter has to become member of the concerned Export Promotion Council and obtain RCMC - Registration cum membership Certificate.

Check in customs – Document submitted is processed by customs authorities, and following are checked - *Chapter 3 Para 39 of CBE&C's Customs Manual, 2001*. –

- Value and classification of goods under drawback schedule in case of drawback shipping bills
- Export duty / cess if applicable
- Advance License shipping bills are checked to ensure that description in invoice and final product specified in Advance License matches. If necessary, samples may be drawn and assessment may be done after visual inspection or testing
- Exportability of goods under EXIM policy and other laws - Some exports are totally prohibited under various Acts e.g. items restricted or prohibited under Foreign Trade (Regulation) Act; antiques; art treasures; Arms; narcotics etc. Some items like tea, coffee and coir products can be exported only against authorization/ license under respective Acts

Examination of goods before export - After shipping bill is passed by export department, the goods are presented to shed appraiser (exports) in dock for examination. Goods will be examined by examiner. This inspection is necessary (*a*) to ensure that prohibited goods are not exported (*b*) goods tally with description and invoice (*c*) duty drawback, where applicable, is correctly claimed.

Let Export Order by Customs Authorities - Customs Officer will verify the contents and after he is satisfied that goods are not prohibited for exports and that export duty, if applicable is paid, will permit clearance. (section 51) by giving 'let ship' or 'let export' order.

GR-1, ARE-1, octroi papers, quota certification for export etc. are also signed. Exporter's copy of shipping Bill, GR-1, ARE-1 etc. duly certified are handed over to exporter or CHA. Drawback claims papers are also processed. - *Chapter 3 Para 43 and 60 of CBE&C's Customs Manual, 2001.*

6.2.5 Processing under EDI system

Under EDI system, declarations in prescribed form are to be filed through 'Service Centre' of customs. After verification, shipping bill number is generated by the system, which is endorsed on printed checklist generated for verification of data. Goods are inspected at docks on the basis of printed check list. All documents are submitted to Customs Officer along with checklist. If goods and documents are found in order, 'let export' order is issued. Then two copies of Shipping Bill are generated – one customs and other exporter's copy. Exporter's copy is generated only after EGM (Export General Manifest) is submitted by shipping agent. These are signed by CHA and customs officer and then by Appraiser. SDF, ARE-1, octroi papers, quota certification for export etc. are also signed. Exporter's copy of Shipping Bill, SDF, ARE-1 etc. duly signed are handed over to exporter or CHA. - *Chapter 3 Paras 42 to 60 of CBE&C's Customs Manual, 2001.*

Conveyance to leave on written order - The vessel or aircraft which has brought imported goods or which carry export goods cannot leave that customs station unless a written order is given by Customs Officer. Such order is given only after (*a*) export manifest is submitted (*b*) shipping bills or bills of export, bills of transshipment etc. are submitted (*c*) duties on stores consumed are paid or payment of

the same is secured (*d*) no penalty is livable (*e*) export duty, if applicable, is paid. - - Such permission is not required if the conveyance is carrying only luggage of occupants.

6.3 EXCISE DOCUMENTATION

Besides the aforesaid procedures, various other procedures have been prescribed. These are mainly to be followed by the person in charge of conveyance.

Boat Notes - If the vessel has to unload only a small cargo, it may not spend time in having berth in the port. If the small cargo is to be sent to shore, it may be loaded in a small boat and sent to shore. As per section 35, such small boat must be accompanied by a 'Boat Note'. Boat Notes Regulations provide that such Boat Notes will be issued by Customs Officer. It will be maintained in duplicate and should be serially numbered. Boat Note should be in prescribed form.

In case of export, if small export cargo is to be loaded in ship through small boat, no Boat Note is required if the cargo is accompanied by the 'Shipping Bill', otherwise, Boat Note is required. Boat Note is also required for transshipment of cargo, i.e. transfer from one ship to another or for re-shipment.

Transit Goods - Section 53 provide that any goods imported in any conveyance will be allowed to remain on the conveyance and to be transited without payment of customs duty, to any place out of India or any customs station. However, all these goods must be mentioned in import manifest or import report submitted by person in charge of conveyance. Such goods should not be 'prohibited goods' under section 11 of Customs Act. [The conveyance may be vehicle, ship or aircraft]. After transit, the goods may go to another customs station.

On arrival at customs station, the goods will be liable to customs duty as if it is first importation in India. - section 55.

Transshipment of Goods - Goods imported in any customs station can be transshipped without payment of duty, u/s 54 of Customs Act. Transshipment means transfer from one conveyance to another. [The conveyance may be vehicle, ship or aircraft]. Such transshipment may be to any major port or airport in India. The goods can be transshipped to any other customs station in India if customs officer is satisfied that the goods are *bonafide* intended for transshipment to any customs station. The facility is available at all customs ports and Inland Container Depots (ICDs). [*Notification No. 50/95-Cus(NT) dated 6-9-95*].

Goods to be transshipped must be specified in Import Manifest or Import report and a 'Bill of Transshipment' should be submitted to Customs Officer. In case of goods being transshipped under an international treaty or bilateral agreement between Government of India and Government of a foreign country, a Declaration of Transshipment shall be submitted instead of Bill of Transshipment. [section 54(1)]. [India has such bilateral agreement with Nepal].

Such goods should not be 'prohibited goods' under section 11 of Customs Act. The goods should be sealed during transshipment by customs officer. A bond has to be executed for the purpose. After execution of bond, a certificate from customs officer has to be submitted within one month that goods have been properly transferred. [Goods Imported (Conditions of Transshipment) Regulations, 1995].

On arrival at customs station, they will be liable to customs duty as if it is first importation in India. - section 55.

TRANSIT AND TRANSHIP - Distinction between transit and transshipment is that in 'transit' goods continue to be on same vessel, while in transshipment, goods are transferred to another vessel / vehicle. Hence, procedures are also different.

Coastal goods - Coastal goods means goods transported from one port in India to another port in India, *but does not include imported goods*. Thus, coastal goods means goods taken by ship from one Indian port to another. No export or import is involved, but control is necessary to ensure that coastal goods are not diverted illegally for export.

LOADING OF COASTAL GOODS - The Consignor should submit bill of coastal goods to Customs Officer (section 93). Form of the bill has been prescribed. These will be loaded by master of vessel only after 'bill of coastal goods' is passed (section 93). Master of Vessel will carry an 'Advice Book' where entries will be made by Customs Officer. This 'Advice Book' has to be presented for inspection of Customs Officers, if called for. After loading, the vessel can leave only after obtaining written order from Customs Officer. As per notification No 15/98-NT dated 27.2.1998, exemption has been granted for delivery of 'Advice Book' at each port of call. However, the 'Advice Book' will have to be submitted for inspection on board of vessel, when called for.

UNLOADING OF COASTAL GOODS - Unloading of coastal goods should be done only at Customs Port or coastal port appointed by CBEC under section 7 of Customs Act. On arrival, all bills relating to goods which are to be unloaded will be delivered to Customs Officer. Unloading can be done only after obtaining permission from Customs Officer. Customs Officer can inspect goods and ask for questions and documents relating to goods. Goods will be unloaded at approved place under supervision of Customs Officer.

Exemption from Duty

Some exemptions from duties are provided in Customs Act, while some are provided in Customs Tariff Act. Besides, Central Government can grant partial or full exemption from duty under section 25 of Customs Act. These exemptions are summarized here.

Exemptions by Notification - Section 25 (1) of Customs Act, 1962 authorizes Central Government to issue notifications granting exemptions from duty. Such exemption may be unconditional or subject to conditions. Such conditions may be required to be fulfilled before or after clearance. Government can also grant exemption by a special order in exceptional circumstances. The exemption notification should be published in gazette. The notification can be issued only in 'public interest'.

Imports by privileged persons and organizations - Import by U N agencies, Governors, Ford Foundation, Vice President of India, specified equipment by foreign news agency, personal effects of deceased persons, gifts imported by CARE have been granted various exemptions.

Foreign Privileged Persons (Regulation of Customs Privileges) Rules, 1957 make provisions for privileges to specified foreign privileged persons i.e. Diplomats (High Commissioner, Ambassadors, Consul General etc). The imports of goods for their personal use or official use are allowed duty free. They have to produce exemption certificate in prescribed form signed by Head of Diplomatic Mission. Generally, the goods are not checked, but these can be checked if there is suspicion.

They can import cars. These can be sold to another privileged person. These can also be sold to non-privileged person after payment of customs duty, subject to certain restrictions. The car can be sold duty free after four years of import. If the car is totally damaged in accident or stolen, the amount of insurance claim will be treated a scum-duty price and duty so calculated will be payable.

Import for repairs, reconditioning etc. - Goods can be imported for repairs, reconditioning or re-engineering. These have to be re-exported within three years of imports. After imports, the repairs, reconditioning or re-engineering has to be in a bonded warehouse under customs bond. *(Notification No. 134/94 - Cus dated 22-6-94) [It is not necessary that goods must have been manufactured in India]*

Ad hoc exemptions - Section 25(2) of Customs Act permit Government to issue *ad-hoc* exemption from customs duty by issue of a special order in exceptional circumstances. The order should specify the exceptional circumstances for granting *ad hoc* exemption. [Similar provision in section 5A(2) of Central Excise Act]. - - It has been clarified that such exemption can be granted even after duty is paid. In such case, duty has to be refunded - MF(DR) circular No 12/97-Cus dated 12.5.1997.

Exemption of Imports for export - Various schemes have been formed to allow duty free imports of raw materials and components for exports. These include schemes like FTZ, 100% EOU, STP, EHTP, Advance Licenses etc. Import of materials for job work and return are also permitted. These are discussed in a later Chapter on 'Export Incentives'

Project Imports - Heavy Customs duty on imported machinery for projects make the initial project cost very high and project may become unviable. Hence, concept of 'project Import' has been introduced to bring machinery etc. required for initial setup or substantial exemption at confessional customs duty.

The goods are classified under heading 98.01, though the machinery and its parts may actually fall under different tariff heading. This simple method is adopted, as otherwise, classifying each machinery and its parts in different heads and valuing them would have been cumbersome and would have delayed clearances, which would cause demurrages. - *Chapter 5 Para 1 of CBE&C's Customs Manual, 2001*.

DUTY PAYABLE - Duty on project imports is basic 25% plus CVD of 16% plus of SAD 4%. .Basic customs duty for fertilizer projects, coal mining projects and power generation projects is 5%. [Notification No 16/2000-Cus dated 1-3-2000]. *[Since now customs duty is generally 25%, 'project import' is relevant only in case of projects where basic duty is 5%]*.

ITEMS ELIGIBLE FOR PROJECT IMPORTS - The items eligible are specified in heading 98.01 of Customs Tariff Act. These are : all items of machinery including prime movers, instruments, apparatus and appliances, control gear and transmission equipment, auxiliary equipment (including those for research and development, testing and quality control); as well as components or raw materials for manufacture of these items and their components; required for *initial setting up of a unit or substantial expansion*.

PROJECTS ELIGIBLE - The projects eligible are : (*1*) Industrial Plant (*2*) Irrigation Project (*3*) Power Project (*4*) Mining Project (*5*) Project for oil or mineral exploration (*6*) Other projects as may be specified by Central Government. Under this head, Central Government has specified various projects like Mumbai Water supply, Mathura-Delhi- Ambala-Jullunder Pipeline, Nhava Sheva port Gas pipe line project, Konkan Railway project etc.

REGISTRATION OF CONTRACT - Contract for import has to be registered with Customs. Application for registration of Contract must be made before importation and contract must be

registered before order for clearance of goods is made from Customs. The contract can be amended if required.

Documents to be submitted while registering contract are specified in Chapter 5 Para 8 of CBE&C's Customs Manual, 2001.

FINALIZATION OF CONTRACT - After contract is completed, importer has to submit a statement giving details of goods imported with proof of value and quantity within three months of clearance of goods. If necessary, Plant Site Verification may be carried out in case of large project contract exceeding Rs one crore. - *Chapter 5 Para 12 and 13 of CBE&C's Customs Manual, 2001.*

Remission on lost/pilfered/damaged goods

Customs Act provides for remission of duty on goods lost/damaged/pilfered before clearance. These provisions have been specifically made because pilferage of goods in ports is very heavy - particularly of small and costly items.

Remission on lost/pilfered goods - Section 23(1) of Customs Act provides for remission of duty on imported goods lost (*other than pilferage*) or destroyed, if such loss or destruction is at any time before clearance for home consumption. Section 13 provides that if imported goods are pilfered after unloading but before order for clearance is passed by Customs Officer for clearance for home consumption or deposit in a warehouse, no duty is payable on the goods, unless the pilfered goods are restored to importer.

Normal practice is to inspect the goods in the port before payment of duty. The Duty is paid only when imported goods are found to be in order. Shortages should be informed to customs authorities and they should be involved in examination of goods, to prove shortage of goods. In *All India Glass Mfgrs Federation* v. *CC* 1991(55) ELT 5 (SC), it was held that damage to goods should be proved before goods are cleared from customs.

NO REMISSION AFTER GOODS ARE CLEARED FOR HOME CONSUMPTION – No remission for short delivery can be obtained after goods are cleared from customs. – *Partap Steels* v. *CC* 2001(135) ELT 168 (CEGAT).

REMISSION AFTER GOODS ARE WAREHOUSED – Remission of duty on goods warehoused is permissible u/s 23, as goods cleared for warehousing are not 'goods cleared for home consumption'. – *Winsome Yarn* v. *CCE* 2001(134) ELT 686 (CEGAT). [In a contrary decision, in *Pasupathi Overseas P Ltd.* v. *CC* - 1996(88) ELT 795 (CEGAT), it was held that no remission can be given in respect of warehoused goods. The decision probably needs review]. - - Loss of goods due to theft (pilferage) in warehouse is not covered u/s 23 and remission is not admissible. - *Himalaya Granites* v. CCE 2001(135) ELT 1212 (CEGAT). [Issue is arguable].

Difference between sections 13 and 23 (1) - Difference in sections 13 and 23 (1) can be summarized as follows :

Section 13 deals with pilferage, while section 23 (1) deals with loss or destruction of goods, except pilferage.

No duty is payable at all under section 13, but liability revives of duty if goods are restored. However, duty is payable under section 23 (1), but it is remitted by Assistant Commissioner of Customs. Thus, unless remitted, duty has to be paid under section 23 (1).

Under section 13, importer does not have to prove pilferage. However, under section 23 (1), burden of proof is on importer to prove loss or destruction.

Under section 13, pilferage should be before order for clearance is made, while under section 23 (1), loss or destruction can be any time before clearance.

Under section 13, loss must be only due to pilferage. However, under section 23 (1), loss or destruction may be due to fire, accident etc. but not pilferage. e.g. loss by leakage is covered under this section.

Under section 13, normally duty is not paid. However, if duty is paid before examination of goods, refund can be claimed if goods are found to be pilfered during examination but before order for clearance is made. Under section 23 (1), if duty is paid, then refund can be obtained only if remission is granted by Customs Authorities. Thus, remission under section 23 (1) is at the discretion of Custom Authorities. [Of course, the discretion has to be exercised judiciously].

Section 13 is not applicable for warehoused goods, while section 23 (1) is applicable for warehoused goods also. [as goods transferred to warehouse are not 'cleared for home consumption']. As per section 23(2) of Customs Act, importer cannot relinquish the title in goods after order for clearance for home consumption. However, in case of warehoused goods, the owner of warehoused goods can relinquish the title of goods any time before order for home clearance is made. He will be required to pay rent, interest, other charges and penalties that may be payable, but duty will not be payable [*proviso* to section 68 inserted w.e.f. 14-5-2003]. [Really, this is not permitted as per wording of section 23(2). However, since proviso to section 68 is a specific provision and added later, it will prevail].

Loss after order of clearance but before actual clearance - Section 13 provides that duty on pilfered goods is not payable if the imported goods are pilfered before order of clearance is made. This section is on basis of principle that goods are not in control of importer when they are in port and he should not be penalised if these are pilfered .As the sections 13 and 23 (1) stand today, there is no remedy if goods are pilfered **after** the order for clearance is made but **before** the goods are actually cleared.

REMISSION IF GOODS LOST AFTER ORDER OF CLEARANCE BUT BEFORE PHYSICAL CLEARANCE - In *CC* v. *Saw Pipes* 2001(137) ELT 244 (CEGAT), it was (indeed rightly) held that 'clearance for home consumption' cannot be equated with order of clearance for home consumption. Physical removal of goods which is the 'clearance for home consumption' can take place only after such an order is passed. Such clearance therefore is an event distinct and separate from the order permitting clearance. [This decision is relevant for purpose of section 23(1) and not for section 13, as wording used in section 13 is different].

Duty on pilfered goods is payable by port authorities - Once goods are unloaded from ship/aircraft, they are in custody of port trust authorities or airport authorities till the goods are cleared. They are in position of 'bailee'. If goods are pilfered after they are unloaded but before they are cleared from the port, the customs duty is payable by port trust authorities or airport authorities under whose custody the goods were lying [section 45(3)]. Thus, though importer does not have to pay duty on pilfered goods, the same is payable by authorities who were custodians of the goods so that Government does not lose any revenue on account of pilferage.

Remission on relinquished goods - If the importer decides to abandon the goods, he shall not be liable to pay any duty [section 23 (2) of Customs Act]. Such situation normally arises if the goods are in very

deteriorated condition and importer may feel that it is not worthwhile to pay duty and incur further losses. The importer may also abandon the goods if the assessment of duty is done on much higher side than expected by him. In such case, he may abandon the goods if he feels that it is cheaper to abandon the goods than to pay heavy customs duty. He should relinquish title before (*a*) an order for clearance of the goods for home consumption *or* (*b*) before order permitting deposit of goods for warehousing is made.

However, even if goods are warehoused, the owner of warehoused goods can relinquish the title of goods any time before order for home clearance is made. He will be required to pay rent, interest, other charges and penalties that may be payable, but duty will not be payable [*proviso* to section 68 inserted w.e.f. 14-5-2003]. The word 'interest' is not clear and is likely to lead to litigation. It has been consistently held that when duty is not payable, question of payment of duty does not arise.

Abatement of duty on damaged goods - Section 22 of Customs Act provides for reduction in duty if goods are damaged or deteriorated in any of the following cases : (*a*) damaged before or during unloading in India (*b*) damaged by accident after unloading but before examination of goods for assessment by Customs Officer - provided that the accident is not due to wilful act, negligence or default of importer, his employee or agent (*c*) damaged by accident in warehouse before clearance of goods - provided that the accident is not due to wilful act, negligence or default of importer, his employee or agent. The customs duty chargeable will be in proportion to the value of damaged good to value of goods before damage or deterioration e.g. if value of goods is Rs. 10,000 and after damage, the value is Rs. 2,000, then 20% of the normal customs duty is payable. The value of damaged goods may be decided by Assistant Commissioner of Customs, or if the owner agrees, the damaged goods may be sold by auction and gross sale proceeds of the auction will be deemed to be the value of goods.

Demand of Customs Duty

If it is found that duty is not levied or short levied or erroneously refunded, Customs officer can raise a show cause notice for demanding the duty [section 28].

Period for issue of Show cause Notice for demand - The notice must be issued within six months from relevant date. However, in case of import by an individual for his personal use or by Government or by any charitable, research or charitable Institution or Hospital, the demand can be raised within one year of relevant date. This period can be extended to five years in case the short levy or non-levy or refund was due to collusion, wilful mis-statement, suppression of facts or fraud by importer, exporter, agent or employee of importer/exporter. While counting this period, if Court had granted a stay against issue of notice, that period will not be considered [section 28 (1) of Customs Act].

Relevant date for issue of SCN - Relevant date for calculating the limit of six months, one year or five years is (*a*) if duty or interest was not levied, date of order of clearance of goods (*b*) if the duty was provisionally assessed, then date when it was adjusted after final assessment (*c*) if duty or interest was erroneously refunded - date of refund (*d*) if duty was paid or interest levied - date of payment of duty or interest [section 28 (3) of Customs Act].

NO TIME LIMIT FOR ASSESSMENT – Section 17 does not prescribe any time limit for assessment. Thus, if ship was allowed to leave without assessment on execution of guarantee, assessment can be done without any time limit and time limit u/s 28 does not apply. – *Southern India Corpn* v. *ACCE* 2000(123) ELT 251 (Cal HC).

Demand in respect of correction of clerical error - Section 154 of Customs Act provides for correction of - (a) clerical or arithmetical mistakes or (b) errors due to any accidental slip or omission - in any

decision or order passed by Central Government, CBE&C or any officer of Customs can be corrected by the said authority.

Notice can be issued in respect of goods already cleared - Goods are cleared from customs after an order of Assistant Commissioner is issued under section 47 of Customs Act. As per section 128 (2) of Customs Act, if the department is not satisfied with the order, it can file appeal against the order of Assistant Commissioner with Commissioner (Appeals). A question was raised whether, once goods are cleared after issue of order under section 47, a demand can be raised under section 28 or only a review application has to be made under section 128 (2). There were divergent opinions. Finally, Supreme Court, in *UOI* v. *Jain Shudh Vanaspati Ltd.* - 1996(86) ELT 460 (SC) = AIR 1996 SC 2696, has held that action can be taken under section 28 of Customs Act, even after goods are released from Customs, by issuing a show cause notice etc. It is not necessary that appeal must be filed by department u/s 128(2) with Commissioner (Appeals) against order of clearance . - similar decision in *Seshan Printers* v. *CC* - (1996) 84 ELT 72 (CEGAT) * *Component Corporation* v. *CC* 1997(93) ELT 225 (CEGAT).

Interest on delayed payment of duty - Demand, once confirmed, must be paid within three months. Interest is payable from the next month from which duty ought to have been paid [section 28AB of Customs Act as amended w.e.f. 11.5.2001]. The provisions are identical with provisions in Central Excise and hence are not elaborated here.

Other provisions similar to Central Excise - Legal provisions regarding show cause notice, hearing, appealable order etc. are similar to excise. Provisions in respect of Settlement Commission and Advance Ruling are also same as excise. Principle of provisional assessment is also same, though provisions are not identical. Hence, these provisions are not elaborated here.

Section 28 of Customs Act is *pari materia* with section 11A of Central Excise Act, except that the words 'with intent to evade payment of duty' appearing in section 11A do not appear in section 28 of Customs Act.

Recovery of sums due to Government

Section 142 of Customs Act provides that if any duty is demanded or drawback paid is recoverable from a person, it can be (*a*) deducted from any amount payable by any customs officer to such person (*b*) detaining and selling goods belonging to such person, which are under control of Customs authorities (*c*) issuing a certificate to District Collector in whose district any property of the person is situated or where he carries on business. The District Collector can recover the amount as arrears of land revenue. (*d*) Destraining and detaining any property belonging to the person and selling the same (*d*) enforcing a bond executed under the Act.

Detention and sale of any property - If the amount due is not paid, Assistant Commissioner of Customs can, on authorization by a Commissioner of Customs, distain any movable or immovable property belonging to or in control of such person (from whom any sum is recoverable]. The property can be detained until the amount is paid along with cost of the distress or keeping the property. If amount is not paid, the property can be attached and sold by customs authorities. [section 142 (1)©(*ii*) of Customs Act].

This section has been made applicable to Central Excise also. Since these provisions are discussed under Central Excise, these are not repeated here.

Refund of Duty

Refund may be obtainable if customs duty was paid in excess while clearing the goods.

Time limit for filing refund claim - Refund claim should be lodged within six months. This period is one year in case of imports made by individual for personal use or by Government or by any educational, research or charitable institution. If duty was paid under protest, time limit of 6 months / one year is not applicable. [proviso to section 27(1)]. If duty was paid on provisional basis, period of 6 months / one year will be calculated form the date of adjustment of duty after final assessment [Explanation II to section 27 (1) of Customs Act].

Refund claim can be of customs duty and interest paid on such duty. [Note that as per section 47 (2) of Customs Act, 1962, if duty is not paid within two days of return of return of bill of entry to make payment of duty, interest is payable. If excess duty is refunded, *pro rata* interest should also be refunded.]

Refund to Importer/Buyer - Provisions regarding person to whom refund can be granted are as follows :

WHO CAN FILE REFUND CLAIM - Refund claim will be normally filed by importer. However, if the goods were sold and if buyer has paid customs duty, he also can file refund claim, if he has not passed on its incidence to another person. Refund claim should be lodged with Assistant Commissioner. Refund, once sanctioned, will be normally paid to Consumer Welfare Fund, unless the importer/buyer proves that he has not passed on the burden to another person [section 27(2) of Customs Act].

Refund claim cannot be filed by Custom House Agent in his own name, without power of attorney - *VV Dabke* v. *CC* - 1983 (12) ELT 583 (CEGAT) - followed in *Jaswant B Shah* v. *CC* - (1996) 81 ELT 669 (CEGAT).

Refund to buyer/Importer/exporter if no 'Unjust Enrichment' - Under proviso to section 27 (2) of Customs Act, refund of customs duty and interest paid on such duty can be made to importer/buyer only in following cases :

- If Importer/exporter/buyer has not passed on incidence of the duty to another person
- If Imports are made by *individual* for his personal use
- In case of Refund of export duty, if any
- In case of Duty drawback payable to exporter
- If borne by any other such class of applicants, as may be specified by Central Government, by notification, if the incidence of duty has not been passed on to any other person. Such notification has to be placed before Parliament and got approved. (*so far, not a single notification has been issued under this provision*).
- These provisions are overriding provisions and are applicable irrespective of any contrary judgment of Appellate Tribunal or any Court or any other provisions of Customs Act and Rules. Thus, refund provision in any other rule will be always subject to the aforesaid provisions of section 27 (2) of Customs Act.

Application for refund of Customs Duty - Application for refund must be made in prescribed form in duplicate. The form has been prescribed in Customs Refund Application (Form) regulations, 1995.

Duty incidence deemed to have been passed to buyer - Refund is available to importer/buyer only if he has borne the incidence. Section 28D of Customs Act that every person who had paid duty shall be *deemed to have passed on the incidence* to buyer of the goods. (i.e. he is deemed to have recovered the same from buyer). The importer/buyer claiming refund will have to prove that he has not passed on incidence of tax to any other person. [In legal terminology, this means that burden of proof is on

importer/buyer claiming the refund that he has not passed on the incidence. Customs department does not have to prove otherwise i.e. that incidence has been passed on to consumer.]

Unjust Enrichment - Provisions in respect of 'Unjust Enrichment' are similar to those in respect of Central Excise.

Refund beyond six months/one year - Discussions under Central Excise Law on this topic are fully applicable in customs also. These can be granted only under writ powers of High Courts or SLP with Supreme Court. However, such refunds, even if sanctioned, will be subject to provisions of 'unjust enrichment'

Refund of Export duty - Export duty is charged on very few items but section 26 of Customs Act makes provisions for refund of export duty. Export duty is refundable if (*a*) Goods are re-imported within one year (*b*) the goods returned are not 're-sale' and (*c*) refund claim is lodged within six months from date of clearance by customs officer for re-importation. This refund is not subject to provisions of unjust enrichment.

Various schemes like EOU, SEZ, DEEC, manufacture under bond etc. are available to obtain inputs without payment of customs duty/excise duty or obtain refund of duty paid on inputs. In case of Central Excise, Manufacturers can avail Cenvat credit of duty paid on inputs and utilize the same for payment of duty on other goods sold in India, or they can obtain refund. Schemes like manufacture under bond are also available for customs. Manufacturers or processors who are unable to avail any of these schemes can avail 'duty drawback'. Here, the excise duty and customs duty paid on inputs is refunded to the exporter of finished product by way of '*duty drawback*'. Section 75 of Customs Act provide for drawback on materials used in manufacture or processing of export product. Section 37 of Central Excise Act allows Central Government to frame rules for purpose of the Act. Under these powers, 'Customs and Central Excise Duties Drawback Rules, 1995' have been framed.

It may be noted that duty drawback under section 75 is granted when imported materials are used in the manufacture of goods which are then exported, while duty drawback under section 74 is applicable when imported goods are re-exported as it is and article is easily identifiable.

6.3.1 **Drawback Of Customs And Excise Duty Paid On Inputs**

Drawback means the rebate of duty chargeable on any imported materials or excisable materials used in manufacture or processing of goods which are manufactured in India and exported. Export means taking out of India. Supply of stores for use in vessel or aircraft proceeding to foreign port is also covered, since it is treated as 'export' as per section 89 of Customs Act.

Duty Drawback is equal to (*a*) customs duty paid on imported inputs including SAD *plus* (*b*) excise duty paid on indigenous inputs. Duty paid on packing material is also eligible. However, if inputs are obtained without payment of customs/excise duty, no drawback will be paid. If customs/excise duty is paid on part of inputs or rebate/refund is obtained, only that part on which duty is paid and on which rebate/refund is not obtained will be eligible for drawback. *No drawback is available on other taxes like sales tax and octroi*.

Duty drawback of SAD (Special Additional Duty) is allowable. – MF(DR) circular No. 58/2002-Cus dated 12-9-2002.

Processing also eligible for Drawback - Drawback is allowable if any manufacture, process or any operation is carried out in India [section 75(1) of Customs Act]. Thus, drawback is available not only on manufacture, but also on processing and job work, where goods may not change its identity and no 'manufacture' has taken place.

Type of Drawback Rates – All Industry Drawback rates are fixed by Directorate of Drawback, Dept. of Revenue, Ministry of Finance, Govt. of India, Jeevan Deep, Parliament Street, New Delhi - 110 001. The rates are periodically revised - normally on 1st June every year. Data from industry is collected for this purpose. The types of rates are as follows :

ALL INDUSTRY RATE - This rate is fixed under rule 3 of Drawback Rules by considering average quantity and value of each class of inputs imported or manufactured in India. Average amount of duties paid is considered. These rates are fixed for broad categories of products. The rates include drawback on packing materials. Normally, the rates are revised every year from 1st June, i.e. after considering the impact of budget, which is presented in February every year. All Industry drawback rate is not fixed if the rate is less than 1% of FOB Value, unless the drawback claim per shipment exceeds Rs 500.

The AIR (All Industry Rate) is usually fixed as % of FOB price of export products. However, in respect of many export products, duty drawback cap (ceiling) has been prescribed, so that even if an exporter gets high price, his duty drawback eligibility does not go above the ceiling prescribed.

The table gives allocation of the drawback allowed under two heads namely - Customs and Central Excise. The Customs portion covers basic customs duty, surcharge and SAD. Excise portion covers basic and special excise duty and CVD. Duty drawback of customs portion can be paid even if exporter has availed Cenvat credit, as Cenvat credit is only of excise duty and CVD. - MF(DR) circular No. 83/2000-Cus dated 16-10-2000.

The All Industry Rate (AIR) is fixed on the basis of weighted averages of consumption of imported / indigenous inputs of a representative cross section of exporters and average incidence of duties. Hence, individual exporter is not required to produce any evidence in respect of actual duties paid by him on inputs. – MF(DR) circular No. 24/2001-Cus dated 20.4.2001.

BRAND RATE - It is possible to fix All Industry Rate only for some standard products. It cannot be fixed for special type of products. In such cases, *brand rate* is fixed under rule 6. The manufacturer has to submit application with all details to Commissioner, Central Excise. Such application must be made within 60 days of export. This period can be extended by Central Government by further 30 days. Further extension can be granted even up to one year in if delay was due to abnormal situations as explained in MF(DR) circular No. 82/98-Cus dated 29-10-1998.

SPECIAL BRAND RATE - All Industry rate is fixed on average basis. Thus, a particular manufacturer may find that the actual duty paid on inputs is higher than All Industry Rate fixed for his product. In such case, he can apply under rule 7 of Drawback Rules for fixation of Special Brand Rate, within 30 days from export. The conditions of eligibility are (*a*) the all Industry rate fixed should be less than 80% of the duties paid by him (*b*) rate should not be less than 1% of FOB value of product except

when amount of drawback per shipment is more than Rs. 500 (*c*) export value is not less than the value of imported material used in them - i.e. there should not be '*negative value addition*'.

Drawback Rate Fixation - Forms and procedures have been prescribed for submitting details to jurisdictional Commissioner of Central Excise, who will fix the rate of duty drawback. [Earlier, it was done by Director of Drawback, New Delhi, upto 313-2003]

Drawback claim procedure - Exporter shall endorse on the 'shipping bill' the description, quantity and other details to decide whether goods are eligible for duty drawback. He should submit one extra copy of shipping bill for drawback purposes. Copy of Invoice should be submitted.

DECLARATION BY EXPORTER - A declaration should be made rule 12(1)(a)(ii) of Duty Drawback Rules, on shipping bill or bill of export that claim of drawback is being made and that duties of customs and excise have been paid on materials, containers and packing materials and that no separate claim for rebate of duty will be made. If the exporter or his authorized agent was unable to make such declaration due to reasons beyond his control, Commissioner of Customs can grant exemption from this provision of making declaration on shipping bill or bill of export.

Further declarations are also required when brand rate or special brand rate has been fixed. These declarations have to be signed by exporter.

Triplicate copy of shipping Bill is the drawback copy and should be marked as 'Drawback Claim Copy'. It should be submitted with pre-receipt on reverse side with revenue stamp.

DECLARATION FOR NON-AVAILMENT OF CENVAT – (a) If the manufacturer-exporter or supporting manufacturer of merchant exporter is registered with Central Excise, fact of non-availment of Cenvat credit can be verified from ARE-1 form furnished (b) If the manufacturer-exporter or supporting manufacturer of merchant exporter is not registered with Central Excise, they have to submit self-declaration about non-availment of Cenvat in prescribed form. – MF(DR) circular No. 8/2003-Cus dated 17-2-2003. - - The drawback rate consists of two components - customs portion (consisting of basic customs duty, surcharge and SAD) and excise portion (consisting of basic excise duty, special excise duty and CVD). The Cenvat credit is only in respect of central excise. Hence, it has been clarified that even if Cenvat credit has been availed, duty drawback in respect of customs portion will be available.

6.3.2 Duty drawback on Re-export

Section 74 of Customs Act, 1962 provide for drawback if the goods are re-exported as such or after use. This may happen in cases like import for exhibitions, goods rejected or wrong shipment etc. The re-exported goods should be identifiable as having been imported and should be re-exported within two years from date of payment of duty when they were imported. This period (of two years) can be extended by CBE&C on sufficient cause being shown. These should be declared and inspected by Customs Officer. Original shipping bill under which the goods were imported should be produced. The goods can be exported as cargo by air or sea, or as baggage or by post. - . - . - After inspection, export

and submission of application with full details, 98% of the customs duty paid while importing the goods is repaid as drawback.

DISTINCTION BETWEEN SECTION 74 AND 75 - Section 74 is applicable when imported goods are re-exported as it is and article is easily identifiable, while section 75 is applicable when imported materials are used in the manufacture of goods which are then exported - *ABC India Ltd.* v. *UOI* 1992(61) ELT 205 (Del HC). In *LVT Products* v. *CC* 1998(103) ELT 663 (CEGAT), it was held that there is no provision for refund of import duty, if imported goods are re-exported. The assesses can only claim duty drawback u/s 74.

VALUE AT THE TIME OF EXPORT IS RELEVANT - As per section 74(4), goods are deemed to have been entered for export on the date rate of duty is to be calculated under section 16. As per section 16, value of export goods will be taken on the date on which proper officer makes an order permitting clearance of goods for export under section 51 of Customs Act. Hence, 'Value' for the purposes of section 76(1)(b) will be value at the time of export and not the original value of import of the goods. This was stated by Commissioner, Customs; at the meeting of Customs Advisory Committee held at Mumbai dated 28-10-93. (Ref. : W.O.B. 45/93 dated 9-11-93).

GOODS CAN BE RE-EXPORTED TO ANY PARTY AND FROM ANY PORT – It has been clarified that goods can be re-exported to any party (and not only to the same supplier) and re-export can take place from any port. – CBEC circular No. 72/2002-Cus dated 1-11-2002.

DRAWBACK FOR USED GOODS - If the imported goods are used before re-export, the drawback will be allowed at a reduced percentage [section 76(2) of Customs Act, 1962]. If the goods were in possession of the importer, they *might be treated as used* by the importer. As per the rules framed by Central Government, the table is as follows : (*a*) use upto 6 months ; 85% (*b*) 6 months to 12 months : 70% (*c*) 12 months to 18 months : 60% (*d*) 18 months to 24 months : 50% (*e*) 24 months to 30 months : 40% (*f*) 30 months to 36 months : 30% (*g*) over 36 months : Nil. Drawback is allowed if the use is over 24 months only with permission of Commissioner of Customs if sufficient cause is shown.

GOODS FOR PERSONAL USE - If the goods (including motor car) were imported for personal use, the reduction in import duty refundable is 4% per quarter for first year, 3% per quarter for second year, 2.5% per quarter for third year and 2% per quarter for fourth year.

Importance of e-commerce

Structure

7.1 E- Procurement

7.1.1 ***Advantages and disadvantages***

7.2 Components of an E-Procurement System

7.3 E-procurement Processes

7.3 User Maintenance

7.4 Establishing Buyer/Seller Relationships

7.5 Data Transmission

7.6 Advantages of implementing E-Commerce

7.7 The E-enabled Way to Buy

7.8 Impact of E-Procurement in bottom line

7.9 Choosing an E-Procurement package

7.1 E-PROCUREMENT

In simplest terms, electronic procurement defines the automation of an organization's procurement processes using web-based applications. Unlike enterprise resource planning (ERP) systems that enable businesses to automate their internal processes, e-procurement enables widely dispersed buyers and suppliers to come together, interact, and execute purchase transactions directly over the Internet.

In a fully web-enabled e-procurement system, each step in the procurement process occurs electronically. From creating and submitting POs to receiving and paying for goods—all transactional data is automatically routed through workflow processors, reducing the time and cost of procurement activities, and boosting operational efficiency of the e-enabled organization.

E-procurement applications consolidate the paper-based catalogs of multiple vendors by digitizing product information into a single, one-stop shopping source for direct and indirect goods and services. In most cases, e-procurement applications are transparent to end-users. Embedded in the business processes and IT systems of buyers and suppliers, e-procurement applications lower process and inventory costs, extend supplier reach, and improve customer access to suppliers.

E-procurement (**electronic procurement**, sometimes also known as supplier exchange) is the business to business or business to consumer or Business to government purchase and sale of supplies and services through the internet as well as other information and networking systems, such as Electronic data interchange and Enterprise resource Planning Typically, e-procurement Web sites allow qualified and registered users to look for buyers or sellers of goods and services. Depending on the approach, buyers or sellers may specify costs or invite bids Transactions can be initiated and completed. Ongoing purchases may qualify customers for volume discounts or special offers E-procurement software may make it possible to automate some buying and selling. Companies participating expect to be able to control parts inventories more effectively, reduce purchasing agent overhead , and improvement. E-procurement is expected to be integrated with the trend toward computerized Supply chain management

E-procurement is done with a software application that includes features for supplier management and complex auctions. The new generation of E-Procurement is now on-demand or a software-as-a-service.

There are seven main types of e-procurement:

- **Web-based ERP (Electronic Resource Planning)**: Creating and approving purchasing requisitions, placing purchase orders and receiving goods and services by using a software system based on Internet technology.
- **e-MRO (Maintenance, Repair and Overhaul)**: The same as web-based ERP except that the goods and services ordered are non-product related MRO supplies.
- **e-sourcing**: Identifying new suppliers for a specific category of purchasing requirements using Internet technology.
- **e-tendering**: Sending requests for information and prices to suppliers and receiving the responses of suppliers using Internet technology.

- **e-reverse auctioning**: Using Internet technology to buy goods and services from a number of known or unknown suppliers.
- **e-informing**: Gathering and distributing purchasing information both from and to internal and external parties using Internet technology.
- **e-market sites**: Expands on Web-based ERP to open up value chains. Buying communities can access preferred suppliers' products and services, add to shopping carts, create requisition, seek approval, receipt purchase orders and process electronic invoices with integration to suppliers' supply chains and buyers' financial systems.

The e-procurement value chain consists of Indent Management, e- tendering, e-Auctioning, Vendor Management, Catalogue Management, and Contract Management. Indent Management is the workflow involved in the preparation of tenders. This part of the value chain is optional, with individual procuring departments defining their indenting process. In works procurement, administrative approval and technical sanction are obtained in electronic format. In goods procurement, indent generation activity is done online. The end result of the stage is taken as inputs for issuing the NIT.

Elements of e-procurement include Request for quotation

7.1 Advantages and Disadvantages

Advantages include getting the right product, from the right supplier to the right buyer, at the right time, for the right price and the right quantity. In reality e-procurement has the advantage of taking supply chain management to the next level, providing real time information to the vendor as to the status of a customer's needs. For example, a vendor may have an agreement with a customer to automatically ship materials when the customer's stock level reaches a low point, thus bypassing the need for the customer to ask for it. A major disadvantage to this type of agreement could be that the vendor has the power to take advantage of the customer by knowing more information about the customer than they would have if the customer was in a normal supply chain management structure.

In simplest terms, electronic procurement defines the automation of an organization's procurement processes using web-based applications.

Unlike enterprise resource planning (ERP) systems that enable businesses to automate their internal processes, e-procurement enables widely dispersed buyers and suppliers to come together, interact, and execute purchase transactions directly over the Internet.

How E-Procurement works:

In spite of many variations, the most common e-procurement model involves an intermediary service provider or a host who links buyers and sellers in an interconnected supply chain using a web based e-procurement application. The host manages transactions, facilitates communication, aggregates and maintains catalog content, and provides the general infrastructure for the virtual marketplace.

Through this network, buyers may compare products from multiple suppliers in a single electronic catalog or check on an item's price and availability in real time before electronically creating a PO. Once a PO is approved, also electronically, it's sent to the supplier via the host's Web portal

This same Web portal enables suppliers to automatically return real time PO status. After an order ships, buyers can process tracking and receiving functions right from their workstations. Creating an invoice and authorizing payment is handled electronically through the same portal as well !

Beyond merely automating shipping and receiving tasks, however, e-procurement offers far more process improvements and innovative options for streamlining business operations and maximizing strategic initiatives-procurement enables access to global . suppliers, real time communication between buyers and suppliers, electronic payment of invoices, and assignment of logistics freight rating and routing.

E-procurement has also spawned creative new business models such as auctions for suppliers to sell excess inventory, reverse auctions where suppliers bid to fulfill a buyer's order, and trade exchanges where buyers and sellers simultaneously bid for each other's business

7.2 COMPONENTS OF AN E-PROCUREMENT SYSTEM

Though still in its nascent stage, e-procurement has been able to develop its own body of language and as such regardless of its model, each has similar components that must be properly considered and managed to ensure a successful system. These components include Catalog content, Processes, User maintenance, Establishing buyer/seller relationships, Billing management, Price establishment, Data transmission, and System maintenance.

Catalogue content

At the heart of every e-procurement process lies an electronic catalog. Similar to a traditional mail-order catalog, electronic catalogs contain detailed information on products or services available for sale. Suppliers customize the content to address the specific needs of targeted buyers. This content is manipulated and imported into a database that the e-procurement application integrates into web pages

The management of catalog data can be handled using import and aggregation tools or by outsourcing the task to companies specializing in content management. Content providers generally offer the following services:

- Convert catalog data into a uniform language and format
- Gather and aggregate data from multiple suppliers into one catalog
- Publish and maintain the product catalog

Once a catalog is created, various cataloging strategies are used to provide access to the content. Strategies include using a centralized catalog model where the aggregated data is hosted at a central location, a distributed model where data resides at multiple sites, or a content-retrieval method where suppliers present catalog data directly to buyers.

There are three types of catalogues that address various buyer needs :

- Product catalogs: Contain data on tangible items such as office products, medical supplies, rolls of steel, etc.
- Service catalogs: Offer professional service "intangibles" such as office maintenance services, temporary personnel services, etc.
- Commodity-specific catalogs: Offer specific product families or groups such as chemicals, paper, or other raw materials

7.3 E-PROCUREMENT PROCESSES

In addition to creating an electronic catalog, existing procurement processes need to be "electrified" end-to-end to support the entire e-procurement process. This includes requisition and order management, real-time tracking and receiving, online order fulfillment, automatic billing, invoicing and payment, as well as workflow management, commerce transactions, and reporting and analysis tools.

Note that an effective e-procurement platform must support both the buyer's and the supplier's business processes. It should also offer functionality that can easily be customized and configured to meet specific e-procurement requirements. In general, a successful e-procurement solution will be founded on an open, component-based model that offers easy configurability and scalability.

7.4 USER MAINTENANCE

Closely related to the two preceding process management components, user maintenance includes defining the individuals authorized to use the e-procurement system, how these users will be enrolled, and how to provide them access to the trading community. This component serves as the foundation for managing the complex buyer-supplier relationships that will occur within the marketplace.

E-procurement user maintenance must address two primary tasks:

Establish user profiles, access rules, catalog filters, and workflow Allow for unique pricing and contractual relationships between a buyer and supplier The following steps are vital to successful user management:

Creating the buyer organization: Identifying and defining the individual buyers, how they will form buying groups, and how they will access the e-procurement process Creating the supplier organization: Identifying sellers, maintaining company profiles, and creating shipping options and other high-level

parameters for supplier activities E-procurement organization: Aggregating the entire marketplace, including buyer and supplier, to include such things as hours of operation, billing rates, etc.

Additionally, user maintenance requires establishing authorization levels and associated procedures to precisely govern buyer and supplier capabilities. Three authorization levels that must be addressed are:

Access to the electronic catalog: Defines who may access catalogs and how to do so Creating and editing requisitions: Defines who can create requisitions, who can edit requisitions, and who can edit accounting codes

Managing orders: Defines who has access to POs and who has authorization to override shipping or billing information

Establishing Buyer/Seller Relationships

This component has two phases: managing supplier relationships and managing pricing. Buyers and sellers may be linked based on their previous buying relationship or based on the buyer's unique needs. Buyers may make purchases based on negotiated contracts or choose the specific commodities they need from customized catalogs. Price lists too may be customized for a buyer or buying group. For example, prices may be established by adding filters that dynamically calculate a price as a markup or discount of the list price. Or groups of buyers may be categorized into classes with filters applied for each group.

Billing Management

E-procurement revenues are generally based on transaction fees. A billing management system will calculate usage charges and generate and distribute statements or invoices to buyer-seller members of the e-procurement network. Suppliers may also use the billing system to calculate ordering charges or to distribute operating costs for specific orders. These functions must directly interface with back office invoicing systems to automatically generate bills.

Price Establishment

Effective pricing enables buyers to negotiate the best possible deals and sellers to liquidate excess inventory. Two major pricing options are used: Dynamic Pricing and Fixed Pricing.

Dynamic pricing: Allows buyers and sellers in an Internet market to trade goods and services at prices determined by market forces instead of by a predetermined price list or catalog. An example of dynamic pricing includes business services such as auctions, reverse auctions, and exchanges Fixed pricing: Based on a predetermined price list or catalog prices negotiated between a buyer and seller

7.5 DATA TRANSMISSION

Transmitting data over the Internet involves two facets: messaging agents and security. Data and messaging tools enable the Internet-based exchange of transactional data between different buyers and suppliers in the e-procurement marketplace. To do this, transactions are sent via the Internet as "messages" and then integrated into a supplier's or buyer's back-office system, enabling financial postings that coincide with the receipt, payment, and invoicing processes. Data messaging tools are also used to cancel transactions and log failures when messages can't be delivered within a predefined time period or following a specified number of attempts. The most important aspect of the messaging tool is that it enables real-time communication between buyers and sellers.

Coincidentally, security is an important aspect of any Internet transaction. Protecting a buyer's confidential financial information and ensuring that only designated buyers have access to supplier product information is critical to ensuring confidence in any e-procurement system.

System Management

Maintaining an e-procurement system involves configuring and monitoring performance usage, average response time, transaction sources, and traffic patterns. To maximize the benefits and strategic opportunities e-procurement systems offer, this information should be used to analyze growth patterns, session times, and ultimately to fine-tune the system's performance to fit specific market communities or technical environments.

Once an e-procurement system is up and running, it's important to monitor traffic and system securityon a day-to-day basis. Inadequately designed transaction engines can result in poor marketplace performance, lack of scalability, breakdowns in security, and, ultimately, frustrated users.

7.6 ADVANTAGES OF IMPLEMENTING E-COMMERCE

In the pre e-procurement days....

In a manual, non-e-enabled procurement environment, the purchasing process typically is :

1. Product selection: The sales representative must search numerous vendor catalogs without knowledge of which vendors offer discounts. The sales representative may even be in the field with no access to the company's product catalogs.

2. Check availability/prices: Calls may need to be made to the vendor to confirm pricing, quantity, availability, etc

3. Create and approve requisition: A paper requisition with correct item numbers and prices needs to be created and approved, a process that often takes up to 3 days or more.

4. Generate and approve P.O. : Once the requisition is approved, the purchasing department splits the requisition into several purchase orders because the material requested must be supplied by multiple vendors.

5. Send P.O. to vendor: Purchase orders are eventually mailed or faxed to the vendors.

6. Vendor confirmation: The vendors confirm receipt of the purchase orders and promise delivery within three business days.

Typically, the promised delivery date ranges from 5-7 business days from the time the requisition is initially filled out. In the interim, our enterprising sales representative, knowing the delays and accompanying frustrations of the company's purchasing process, has decided to buy the items at a local office supply superstore. This way, the representative acquires the necessary equipment without delay and with a lot less effort. Unfortunately, the company's cost for paying retail price is much higher than necessary.

7.7 E-ENABLED WAY TO BUY

The benefits of e-procurement over manual purchasing are many and multifaceted. For example:

Streamlined processes reduce transaction time: Buyers can search electronic catalogs containing goods and services from multiple suppliers and compare products and prices on-line. Real time communication allows buyers to check current prices and quantities. Suppliers can provide instant PO status

The E-enabled Way to Buy...

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Streamlined processes reduce transaction time: Buyers can search electronic catalogs containing goods and services from multiple suppliers and compare products and prices on-line. Real time communication allows buyers to check current prices and quantities. Suppliers can provide instant PO status.

Greater standardization of procurement processes: Electronic catalogs provide a standardized listing of items allowing for easier item comparison. Business rules governing all users and all transactions can be built into the application. Regardless of where they're located, buyers can access catalogs using a standard web browser.

Greater access to suppliers: Using virtual e-procurement portals, buyers have access to suppliers around the globe, which translates into a wider selection of goods and services

Global operability: E-procurement applications can support multiple languages and currencies, as well as international financing, taxation, and shipping regulations

Ease of configurability and scalability: Web-based procurement applications can be configured to meet the unique needs of buyers and sellers and be scaled to grow as the organizations grow.

Building of trading communities: E-procurement allows the development of both horizontal and vertical trading communities offering consolidated buying power for the purchaser and increased range for new supply chains.

Lower costs: Cost efficiency results from a variety of factors including reduced time between order creation and order fulfillment, greater selection of goods and services from which to choose, formation of trading communities to consolidate buying power, the opportunity to purchase surplus products and services below market prices, and more !

Increased productivity: Automated procurement processes can yield significant time savings at all levels across an enterprise, increasing opportunities for employees to focus on more strategically important tasks and functions.

Increased opportunity to leverage preferred vendor relationships: According to a leading e-procurement systems vendor, 80% of indirect goods and services are purchased from vendors classified as "other." This results from the frustrations and time delays inherent in processing paper-based purchases. This practice decreases the volume of purchases from preferred vendors and consequently drives up costs.

7.8 IMPACT OF E-PROCUREMENT IN BOTTOM LINE

E-procurement impacts the system in three ways:

Increased preferred vendor purchases: E-procurement fosters purchasing from preferred vendors, who in turn offer volume discounts and contract pricing. A typical e-procurement system can boost preferred vendor transactions by 25%, returning substantial savings assuming a weighted average preferred-vendor discount of 7%.

Preferred vendor consolidation: As volume shifts to preferred vendors, low-volume vendors will eventually be eliminated from the supplier network, driving more purchases to preferred vendors and enabling them to increase consumer discounts.

Spot discounts: Because of the dynamic nature of on-line pricing, vendors can offer limited-time spot discounts on excess inventory. Even a one-percent reduction in purchasing expenses can yield significant savings for large organizations.

Reduced labor time/reduced transaction costs

By far, the greatest e-procurement savings result from the combination of less time required for the total purchasing cycle and the subsequent reduced transaction costs. Together, these decreased transactional factors translate into significant cost savings.

The table below shows the approximate time it takes to complete each step in a single corporate purchasing cycle, comparing manual or electronic data interchange (EDI) purchases to e-procurement.

This Table demonstrates nearly fivefold reduction in time and nearly 80% reduction in cost directly attributable to e-procurement.

E-procurement Offers Tremendous Opportunity to Save Both Now project your own potential e-procurement benefit by multiplying the Per Purchase Savings rate by the number of purchase orders your own organization processes in a single year. Depending on the size of your enterprise, e-procurement savings could amount to millions of dollars annually. For suppliers, e-procurement stands to yield significant reductions in inventory holding times and safety stock levels, and an overall reduction in the purchasing cycle—the time it takes from ordering an item to receiving it.

Key factors for E-Procurement implementation:

While e-procurement offers many quantifiable benefits, it still poses many issues that must be carefully considered before implementing a specific solution. Effectively addressing these issues will help ensure both a rapid and a complete implementation—one that will help your organization realize all the benefits of e-procurement, including a lower initial system investment and an increased return on your investment.

Consider these questions before you choose an e-procurement solution or provider, and consider how your answers will help you minimize the risks and maximize the rewards of your new system:

Is my organization ready for e-commerce?

Do you already have an e-commerce strategy? How will e-procurement integrate into that strategy? If you don’t have an e-commerce strategy in place, how can you build one that will support e-procurement as well as all future e-commerce activities?

How will I bring my suppliers on board?

E-procurement will change the buyer/seller relationship.

How will your current supplier relationships need to change to maximize the e-procurement solution? What strategies must be developed to build and maintain those relationships?

How will my current procurement processes need to change to maximize e-procurement?

Is your business model aligned with your system model? Where are the gaps and how can they be closed?

How can I create a scalable infrastructure that will support future growth?

Industry studies indicate that e-procurement is poised for explosive growth.

Factors driving this growth include the number of buyers and suppliers participating, increased accessibility to authorized users throughout an organization, improvements in Internet e-commerce software, and organizational growth.

This translates into increased transaction volume that can easily overwhelm the capacity of an e-procurement system. Will your current infrastructure support e-procurement?

Is your hardware configuration scalable to support additional servers, processors, and an increase in transactional volume? Note that e-procurement software must be object-based to support the addition of custom or third party applications, as well as easy integration with your current back office systems, as the needs of your marketplace change.

7.9 CHOOSING AN E-PROCUREMENT PACKAGE

With the recent proliferation of proven, commercial e-procurement applications, there's no need to build your own. However, consider the following factors when choosing your own solution:

Does it support the full e-procurement cycle?

Does the application take advantage of your organization's current Internet environment?

Does the e-procurement application provide ease of configurability and scalability? How secure is the data going across the Internet?

Are catalog content-management services provided?

How easily will the e-procurement solution integrate with your existing back-office ERP or legacy systems?

What support is provided to bring suppliers on board, as per the requirement of the situation ?

Does system administration lend itself to adding and changing routine system information on users, bill-to and ship-to addresses, cost centers and organizational attributes, suppliers and related information?

Does it support extended business services such as auctions, reverse auctions, and exchanges? Does it support value-added services such as bill payment, logistics, and taxation? Will the vendor provide regular updates and software support?

Expertise needed for E-procurement success ?

Successful e-procurement implementation requires a number of unique technical, functional, and project-management skills including :

Knowledge of the current e-commerce marketplace

Industry expertise in procurement practices

E-procurement implementation expertise

Experience integrating e-procurement packages with ERP and legacy systems

Strategies for supplier adoption and maintaining supplier relationships

Experience in managing product catalog content

Technical knowledge of web-based development tools and networking architecture

ERP and Its Implementation

Structure

8.1 Definition of ERP

8.2 Importance of ERP

8.3 Globalization and ERP

8.4 Documentation and ERP

8.5 Evolution of ERP

8.6 Selecting the Software

8.7 Cost of Implementation

8.1 DEFINITION OF ERP

Enterprises Resource Planning (ERP) is a software based production planning and inventory control system used to manage manufacturing processes. Although it is not common nowadays, it is possible to conduct ERP by hand as well.

An ERP system is intended to simultaneously meet three objectives:

- Ensure materials and products are available for production and delivery to customers.
- Maintain the lowest possible level of inventory.
- Plan manufacturing activities, delivery schedules and purchasing activities.

The scope of ERP in manufacturing

Manufacturing organizations, whatever their products, face the same daily practical problem - that customers want products to be available in a shorter time than it takes to make them. This means that some level of planning is required.

Companies need to control the types and quantities of materials they purchase, plan which products are to be produced and in what quantities and ensure that they are able to meet current and future customer demand, all at the lowest possible cost. Making a bad decision in any of these areas will make the company lose money. A few examples are given below:

- If a company purchases insufficient quantities of an item used in manufacturing, or the wrong item, they may be unable to meet contracts to supply products by the agreed date.

- If a company purchases excessive quantities of an item, money is being wasted - the excess quantity ties up cash while it remains as stock and may never even be used at all. However, some purchased items will have a minimum quantity that must be met, therefore, purchasing excess is necessary.
- Beginning production of an order at the wrong time can cause customer deadlines to be missed.

ERP is a tool to deal with these problems. It provides answers for several questions:

- What items are required?
- How many are required?
- When are they required?

ERP can be applied both to items that are purchased from outside suppliers and to sub-assemblies, produced internally, that are components of more complex items.

The data that must be considered include:

- The *end item* (or items) being created. This is sometimes called Independent Demand, or Level "0" on BOM (Bill Of Material).
- How much is required at a time.
- When the quantities are required to meet demand.
- Shelf life of stored materials.
- Inventory status records. Records of *net* materials *available* for use already in stock (on hand) and materials on order from suppliers.
- Bills of materials. Details of the materials, components and subassemblies required to make each product.
- Planning Data. This includes all the restraints and directions to produce the end items. This includes such items as: Routings, Labor and Machine Standards, Quality and Testing Standards, Pull/Work Cell and Push commands, Lot sizing techniques (i.e. Fixed Lot Size, Lot-For-Lot, Economic Order Quantity), Scrap Percentages, and other inputs.

Outputs

There are two outputs and a variety of messages/reports:

- Output 1 is the "Recommended Production Schedule" which lays out a detailed schedule of the required minimum start and completion dates, with quantities, for each step of the Routing and Bill Of Material required to satisfy the demand from the MPS.
- Output 2 is the "Recommended Purchasing Schedule". This lays out both the dates that the purchased items should be received into the facility AND the dates that the Purchase order , or Blanket Order Release should occur to match the production schedules.

Messages and Reports:

- Purchase orders . An order to a supplier to provide materials.

- Reschedule notices. These *recommend* canceling, increasing, delaying or speeding up existing orders.

Note that the *outputs* are *recommended*. Due to a variety of changing conditions in companies, since the last ERP / ERP system Re-Generation, the recommended outputs need to be reviewed by *trained* people to group orders for benefits in set-up or freight savings. These actions are beyond the linear calculations of the ERP computer software.

Problems with ERP systems

The major problem with ERP systems is the integrity of the data. If there are any errors in the inventory data, the bill of material (commonly referred to as 'BOM') data, or the master production schedule, then the outputted data will also be incorrect. Most vendors of this type of system recommend at least 99% data integrity for the system to give useful results.

Another major problem with ERP systems is the requirement that the user specify how long it will take a factory to make a product (**NOTE: IRRESPECTIVE OF CONSIDERING PRODUCTION CAPACITY, BREAK DOWN WORKER AVAILABILITY WHICH ERP2 INCLUDES, AND PRODUCE OUTPUTS CONSIDERING ALL THESE FACTORS**) from its component parts (assuming they are all available). Additionally, the system design also assumes that this "lead time" in manufacturing will be the same each time the item is made, without regard to quantity being made, or other items being made simultaneously in the factory.

A manufacturer may have factories in different cities or even countries. It is no good for an ERP system to say that we do not need to order some material because we have plenty thousands of miles away. The overall ERP system needs to be able to organize inventory and needs by individual factory, and intercommunicate needs in order to enable each factory to redistribute components in order to serve the overall enterprise.

This means that other systems in the enterprise need to work properly both before implementing an ERP system, and into the future. For example systems like variety reduction and engineering which makes sure that product comes out right first time (without defects) must be in place.

Production may be in progress for some part, whose design gets changed, with customer orders in the system for both the old design, and the new one, concurrently. The overall ERP system needs to have a system of coding parts such that the ERP will correctly calculate needs and tracking for both versions. Parts must be booked into and out of stores more regularly than the ERP calculations take place. Note, these other systems can well be manual systems, but must interface to the ERP. For example, a 'walk around' stock take done just prior to the ERP calculations can be a practical solution for a small inventory (especially if it is an "open store").

The other major drawback of ERP is that takes no account of capacity in its calculations. This means it will give results that are impossible to implement due to manpower or machine or supplier capacity constraints. However this is largely dealt with by ERP 2.

Generally, ERP II refers to a system with integrated financials. An ERP II system can include finite / infinite capacity planning. But, to be considered a true ERP II system must also include financials.

In the (or ERP2) concept, fluctuations in forecast data are taken into account by including simulation of the master production schedule, thus creating a long-term control. A more general feature of ERP2 is its extension to purchasing, to marketing and to finance (integration of all the function of the company), ERP has been the next step.

Two basic characteristics of ERP:

ERP derives demand for components, subassemblies, materials, etc., from demand for and production schedules of *parent items*.

ERP offsets replenishment orders (purchase orders or production schedules) relative to the date when replenishment is needed

Information Needed for ERP

- Demand for all products.
- Lead times for all finished goods, components, parts and raw materials
- Lot sizing policies for all parts
- Opening inventory levels
- Safety stock requirements
- Any orders previously placed but which haven't arrived yet

Information Obtained from ERP

- Planned orders: replenishment orders to be released at a future time
- Order release notice: notices to release planned orders
- Action notices: notices to expedite, de-expedite, or cancel orders, or to change order quantities or due dates
- Priority reports: information regarding which orders should be given priority
- Inventory status information
- Performance reports such as inactive items, actual lead times, late orders, etc.

ERP Inputs

1. Master Production Schedule

Product Structure

Inventory Levels

Lot Sizing Choices in ERP

Lot sizing:

Determining the lot size (order quantity or production quantity) of an item

Static lot sizing rule:

- A decision rule that orders the same quantity each time an order is placed.

- Tend to generate higher average on-hand inventory because they create inventory remnants.
- Can provide extra *safety stock*.

Dynamic lot sizing rule:

- A decision rule that changes the order quantity with each order, typically so that each order is just large enough to prevent shortages over a specified time period.
- Tend to cause instability by tying lot-size to gross requirements.
- Lower-level components may not be able to respond sufficiently fast to changes in requirements.

Static Lot-sizing Rules

1. Fixed order quantity (FOQ)

- Order (or produce) a fixed quantity, or a multiple of that fixed quantity.

2. Economic Order Quantity (EOQ)

- Order (or produce) the economic order quantity, plus any additional items needed to replenish safety stock if it has fallen below its desired level.
- Yields minimum total setup/ordering plus holding costs.
- Assumes relatively constant demand.

Dynamic Lot-sizing Rules

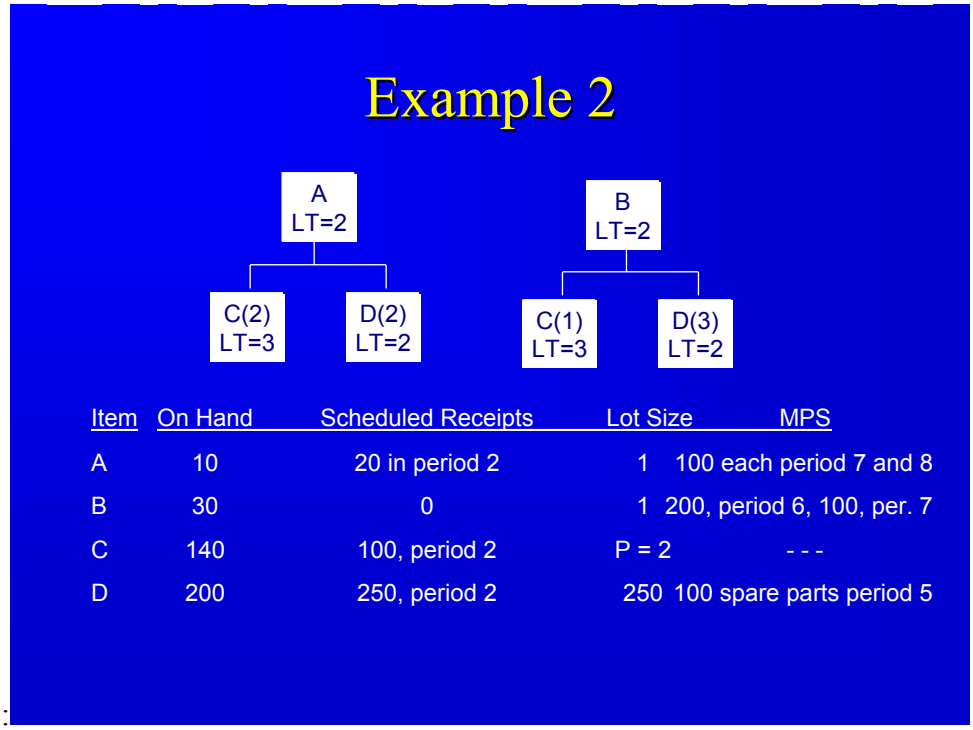
1. Lot-for-Lot (L4L)

- Order (or produce) exactly the quantity required in each period to satisfy gross requirements and to maintain safety stock at its required level.
- Simple to use, and agrees with Just-In-Time philosophy of ordering/producing only when required.
- Lot size can be modified easily for purchase discounts or restrictions, scrap allowances, process constraints, etc.
- Minimizes on-hand inventory, but maximizes number of orders placed (so can be expensive if setup/ordering costs are significant).

2. Periodic Order Quantity (POQ)

- Order/produce a quantity equal to the gross requirements for P periods **minus** any items in on-hand inventory **plus** any additional items needed to replenish safety stock if it has fallen below its desired level.
- Restores safety stock and covers exactly P periods of gross requirements.
- Reduces on-hand inventory by attempting to match the quantity ordered to the quantity required.

Example 1:



Completing ERP Tables

Objective:

The purpose of ERP is to ***schedule orders*** for ***end items*** and the ***components*** of those end items. We wish to determine **when to release orders** and **how much to order**.

Step 1

Begin with the end items. Complete one table at a time.

- Schedule the gross requirements, GR.
- Enter records for any scheduled receipts, SR.
- Consider GR, SR and inventory, I, to determine timing and size of orders we will plan to receive, PR. These are orders which we must receive to meet demand.

$$PR_t = I_{t-1} + SR_t - GR_t - I_t$$

- Use the lead time to schedule the planned order releases, POR, so that the orders are received when they are needed.

$$\text{Time of POR} = \text{Time of PR} - L$$

- A POR for an end item in week t becomes a GR in week t for every component part of the end item.

Step 2

Schedule the components. If a component occurs at more than one level it is scheduled at the deepest level so that you will know all demand for parents of the component before you try to schedule the component.

Level 1 components:

The POR's for end items are scheduled as GR's for level 1 components. Any spare parts orders are scheduled as GR's also.

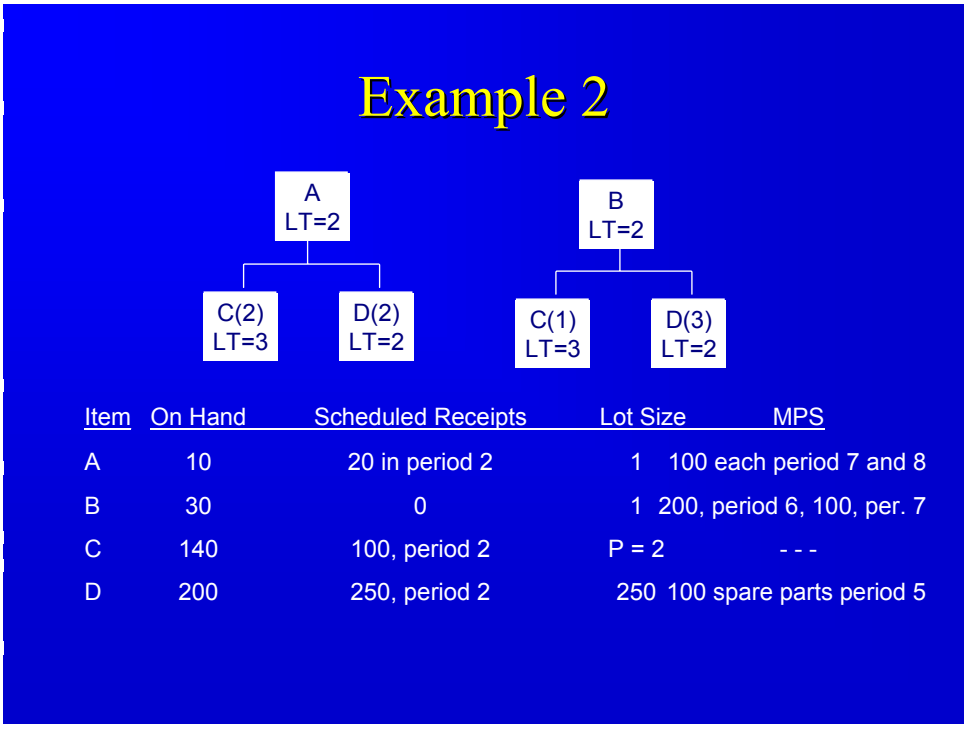
- Complete the table as discussed in step 1.

Repeat the process for all components.

For each component the gross requirements come from planned order releases for all direct parents of the component and from any orders for spare parts.

The final result will be planned orders (quantity and timing) for end products and all of their component which must be made in order to meet demand.

Example 2



Implementation of Materials Requirements Planning Systems

Favorable environments for ERP:

- batch manufacturing environment
- stable demand
- limited number of products
- large number of bill-of-materials levels
- large lot sizes

Some conditions which are less favorable for ERP

Process-focused environments:

- many customized products
- small production volumes
- small number of bill-of-materials levels

Just-In-Time environments:

- small batch sizes
- demand pulls parts and components through the system

Other Types of ERP Systems

Closed-loop ERP:

ERP system that provides feedback to other stages of the production plan, such as the aggregate production plan, capacity plan, and Master Production Schedule.

Manufacturing Resource Planning (ERP II):

A planning system that uses all outputs of a ERP system to integrate production, marketing, and financial plans.

Distribution Resource Planning (DRP):

A time-phased stock replenishment technique for distribution networks based on ERP procedures and logic.

Is ERP a Planning System?

The **ERP** (Enterprises Resource Planning) concept exists since the 60s of the last century. It is the basis for most software systems supporting production planning and control in industrial practice. Most of these so-called ERP systems provide good assistance for order processing, data handling and inventory book-keeping, but they do not support planning.

A typical ERP system follows a successive planning concept, as depicted in the following figure.

Master Production Scheduling.

Based on existing customer orders and a medium-term aggregate production plan Master Production Scheduling (MPS) prepares a short-term production plan for end or rather main products. The planning result is the Master Production Schedule, which is commonly referred to as the MPS.

Material Requirements Planning.

The next step, Material Requirements Planning (ERP), uses the MPS as a starting point and computes derived demands for all components required for the production of the end products. The planning data used are the bill-of-materials structure (BOM structure, Gozinto structure), the current inventory status (including planned receipts) and planned lead times. Within this planning step lot sizes are computed under the assumption that infinite capacity is available. Result of these computations are planned production quantities per item and period.

Capacity Requirements Planning.

Next, for each operation required to make the products the planned starting time and ending time are computed with the help of standard project planning algorithms, such as the Critical Path Method (CPM). Again, capacities of the resources are neglected (infinite loading). Following this planning step, the capacity requirements resulting from infinite loading are tabulated and graphed. Usually the comparison with the available capacities shows that the production plan developed so far is infeasible.

This is the point in time when adjustment of the production plan by the human planner comes into play. Usually based on experience, the planner tries to shift operations on the time axis in order to generate a feasible production schedule. If this is not possible due to conflicts between the resource requirements of different operations, the capacity is extended by overtime, if possible. In general, a human does not have the capability to solve this complicated combinatorial optimization problem, which is a variant of the so-called Resource-Constrained Project Planning Problem (RCPSP).

Production Control.

In the last planning, for the upcoming short-term planning horizon production oders are released and assigned to the resources. For each resource orders are scheduled with the help of simple priority rules.

Critique of the ERP concept

Basically, the ERP concept is nothing else than the automation of order processing procedures that in earlier days have been done manually. Planning methods that support decision making in the sense that a feasible production plan is developed are not applied. The ERP concept has been criticized by many scientists as well as practitioners in a large number of publications. Its flaws are system-immanent and

cannot be deleted by modern data base methods, user interfaces and faster computers. The major flaws to be criticized are:

- The medium-term aggregated production planning which aims at the coordination of sales and operations planning is not supported. Usually the production plan is equated to the sales plan. With scarce resources, however, these both plans must differ.
- The production lot sizes are computed for each item in isolation without consideration of the interdependencies between predecessor and successor items in a multi-level BOM structure. The competition of items for resources is neglected, which leads to infeasible production plans. In addition, the cost-related interdependencies between a parent item and its components are not considered. Whitin the ERP planning phase a successive planning of the items is performed (first requirements computation, then lot sizing), based on an ordering of the items according to their low level codes.
- In the ERP phase and in the Capacity Requirements Planning phase so-called "planned lead times" are used. These are stored as a resource-independent characteristic of an item in the production data base and are often not changed for years. The planned lead time includes estimates of transportation times and of waiting time due to scarcety of production resources. However, it is obvious that the waiting time for a resource depends on the workload of the resource. As the workload and, consequently, the bottleneck status of a resource changes over time, it does not make sense to store the waiting time (as part of the planned lead time) in a data base. The lead times are a result of the planning and not a given.

All planning phase suffer from the severe flaw, that the scarce capacities of the resources are completely neglected in the planning. Only immediately before the start of the production operation on the job shop level the infeasibility of a production schedule is recognized. But at this point in time, it is too late. Delivery delays and superfluous inventory are the consequence.

Material Requirements Planning - Calculations

ERP is basically is a demand explosion concept without any planning functionality, as will be shown below.

The ERP calculations are as follows:

a) Sort items according to their low level code.

b) Consider each item in sequence and perform the following steps:

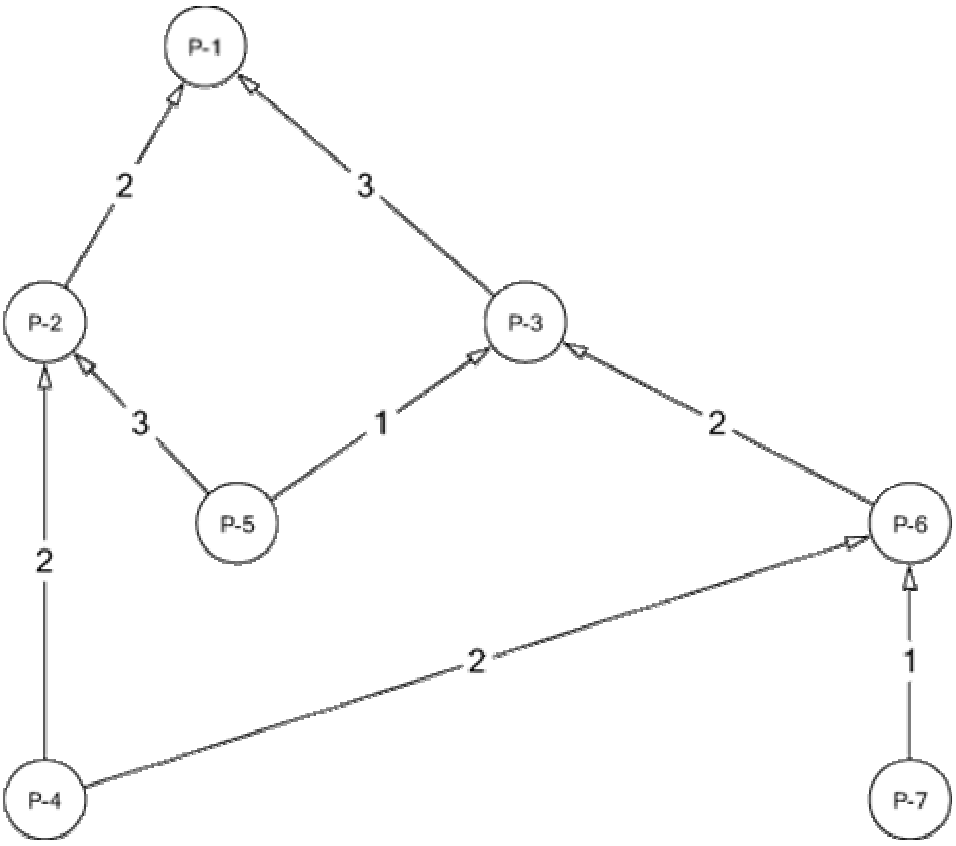
Get external demand (from the master production schedule), sif any

Compute derived demands

Get available inventory (from the inventory records)
Compute net demand
Compute lot sizes (usually with the a heuristic for the single level dynamic not sizzling problem
Offset lots according to the planned lead time and fix production dates

Here is a numerical Example

Consider the following Bill of material(BOM)structure with seven items:



There is a demand of 35 units in period 8 for the end product. The initial inventory on hand for each item is given in the following table:

Product	**P-1**	**P-2**	**P-3**	**P-4**	**P-5**	**P-6**	**P-7**
Inventory	10	15	20	10	10	10	30

For each item 5 unit of safety stock are required. The remaining data are shown in the following table:

Product	**Setup Costs**	**Holding Costs**	**Setup Times**	**Processing Times**	**Resource**	**Lead Time**
P-1	100	4	10	1	1	1
P-2	100	3	10	1	1	2
P-3	100	2	10	1	2	1
P-4	100	1	10	1	2	1
P-5	100	1	10	1	3	2
P-6	100	1	10	1	3	3
P-7	100	1	10	1	4	

A formal computerized approach to inventory planning, manufacturing scheduling, supplier scheduling, and overall corporate planning. The material requirements planning (ERP) system provides the user with information about timing (when to order) and quantity (how much to order), generates new orders, and reschedules existing orders as necessary to meet the changing requirements of customers and manufacturing. The system is driven by change and constantly recalculates material requirements based on actual forecast orders. It makes adjustments for possible problems prior to their occurrence, as opposed to traditional control systems, which looked at more historical demand and reacted to existing problems. Material resource planning (ERP II) evolved from material requirements planning when it was recognized that most major data needed to manage a manufacturing or distribution firm could be obtained from the material requirements planning information. The ability of a material resource planning system to meet the various needs of manufacturing, materials, and marketing personnel within a changing business environment contributes to its growing implementation by manufacturing companies.

A formal computerized approach to inventory planning, manufacturing scheduling, supplier scheduling, and overall corporate planning. The material requirements planning (ERP) system provides the user with information about timing (when to order) and quantity (how much to order), generates new orders, and reschedules existing orders as necessary to meet the changing requirements of customers and manufacturing. The system is driven by change and constantly recalculates material requirements based on actual forecast orders. It makes adjustments for possible problems prior to their occurrence, as opposed to traditional control systems which looked at more historical demand and reacted to existing problems.

The logic of the material requirements planning system is based on the principle of dependent demand, a term describing the direct relationship between demand for one item and demand for a higher-level assembly part or component. For example, the demand for the number of wheel assemblies on a bicycle is directly related to the number of bicycles planned for production; further, the demand for tires is directly dependent on the demand for wheel assemblies. In most manufacturing businesses, the bulk of the raw material and in-process inventories are subject to dependent demand. Dependent demand quantities are calculated, while independent demand items are forecast. Independent demand is unrelated to a higher-level item which the company manufactures or stocks. Generally, independent demand items are carried in finished goods inventory and subject to uncertain end customer demand. Spare parts or replacement requirements for a drill press are an example of an independent demand item.

8.2 THE IMPORTANCE OF ERP

Eric Kimberling (ERP and Business Consultant) posted 3/8/2007 | Comments (11)
It's easy to forget that successful ERP implementations don't end at go-live. If anything, it's after the system is implemented that makes or breaks the success of the system. However, most companies fail to conduct a post-implementation audit to see how their ERP systems are fitting in with the business. Inevitably, there are going to be ongoing changes and adjustments to optimize the way the system is operating and to improve the way it supports your business. Therefore, conducting a post-go-live audit is very important. In particular, these audits should focus on three key areas:

1. Baseline and post-go-live performance measures. Every ERP project should have a solid business case well before the system is selected or implemented. However, the only way to understand the level of ERP business benefits is to measure performance before and after go-live. It is important to establish baseline performance levels, then compare those to the performance levels after go-live. This will help identify areas of under-performance and opportunities for ongoing improvement.

2. Identify ongoing training opportunities. No matter how well you've prepared and trained your employees, there will be a decrease in productivity immediately after go-live. They key is to minimize this drop and help them to eventually be more productive than they were before ERP. Post-implementation audits should explore areas where employees are under-trained or could benefit from ongoing training. This will help optimize the business benefits of your ERP system in the longer-term.

3. Identify opportunities to improve business processes. Just because you have implemented ERP doesn't mean that your business processes are going to be perfect. There are always going to be process inefficiencies and breakdowns that can be improved. By working with employees to identify process pain points and following this up with root cause analysis for these pains, you will identify opportunities to improve your processes and make them more efficient and effective.

8.3 GLOBALIZATION AND ERP

Enterprise resource planning (ERP) is a mission-critical component of any globalization strategy. The information made available through this component is key to providing visibility to key performance indicators (KPIs) and meeting corporate objectives. Yet, this is often overlooked because companies focus only on supply chain issues. The lack of standardized world-wide ERP implementations plagues more than half of global manufactures.
Read this white paper to learn how optimizing your ERP implementation for a global environment will provide benefits among cost, revenue, profitability and customer satisfaction. Explore how you can:

- Streamline and automate business processes and workflows.
- Establish common metrics and reporting standards.
- Standardize implementations.
- Migrate to an SOA version of ERP.

8.4 DOCUMENTATION AND ERP

Points to consider

Consultants don’t like doing documentation.

The volume of documentation on a project can be vast and with the modular nature of ERP systems no single consultant will have a handle on the whole documentation project.

Project managers often have their hands full dealing with day to day decisions.

Documentation is often thought of as an afterthought and this approach can lead to disastrous consequences.

Employing qualified ERP consultants or project managers to perform what is often an administrative function is wasteful of valuable and expensive ERP resources.

ERP implementation is often as much a process of change management within an organisation as it is software configuration and installation. Taking a communicative approach, with appropriate documentation support, can be of great value when helping the culture develop to the point where employees see the change as a career development rather than a threat.

Documentation is understood by Technical Authors who are capable of taking on these responsibilities.

Three levels of documentation

1. Low level configuration specific to the project – only qualified consultants have the knowledge or information to do this.
2. User manuals – often developed from standard vendor manuals with amendments specific to your implementation.
3. Training materials – developed from vendor training materials, possibly amended by your consultants.

Amendments to types 2 and 3 can be made by your consultants or by me with their support.

What I will do for you

- Assess your requirements at the beginning working with overall project managers, team leaders and consultants.
- Take ownership of the whole documentation set.
- Work along side project managers and team leaders to reduce work load by taking on documentation related tasks.
- Where appropriate ensure that each consultant is aware of their responsibilities to produce documentation for their own part of the project and within the appropriate time scales. This might mean representing the requirements of consultants for the resources to perform documentation related tasks rather than simply nagging consultants to get on with work they are seen as reluctant to do.
- Advise on and manage documentation production and tracking where documents are being produced by consultants. This ensures that multiple copies of the same document are not produced and allows me to have final approval on documents before they are released to their readership.
- Look after issues of consistency and presentation for the whole documentation set. This might include naming conventions, release numbering and - where appropriate - corporate identity issues and copyright, etc.

- Advise on the best way to present different aspects of your documentation set, including formatting, publishing options and distribution.
- Publish your documentation in an agreed form and to an agreed time scale.

What I won't do

- Become involved in the creation of the individual documents produced by your consultants except where this is appropriate. This means that I am only able to create documents of a high (non technical) level unless heavily assisted by your ERP implementers.
- Bring vendor specific experience/prejudice to the project. My knowledge is as a Technical Author and general Documentation Consultant with ERP experience as part of my background. As a Technical Author I am able to take a neutral position on information and present it in a way that is appropriate for various audiences. This ensures that non-technical users are not flooded with unfathomable jargon or that technical users receive lengthy explanations that they do not need. This balance is struck by a combination of my documentation experience and the specific experience of your project team.

How long will it take?

- Depending on the size of your implementation this might be a short project where I am involved in the final stages of your overall implementation cycle.
- Alternatively, on larger implementations, I might need to be there from an early stage to help develop the documentation strategy, oversee the production of the documentation set as the implementation progresses, and manage the documentation project throughout.
- For very long implementations it may be appropriate for me to be in place at the start, followed by a gap or perhaps a period of part time attendance, with a full time production stage at the end.
- All these issues can be discussed according to the unique circumstances of your ERP implementation, its time scales and your business needs.

8.5 EVOLUTION OF ERP

ERP systems are now ubiquitous in large businesses and the current move by vendors is to repackage them for small to medium enterprises (SMEs). This migration has many consequences that have to be addressed through understanding the history and evolution of ERP systems and their current architectures. The advantages and disadvantages of the ERP systems will impact their penetration in this new market. The market position and general strategy of the major systems providers in preparation for this push are described. The chapter concludes that the growth and success of ERP adoption and development in the new millennium will depend on the legacy ERP system's capability of extending to Customer Relationship Management (CRM), Supply Chain Management (SCM) and other extended modules, and integration with the Internet-enabled applications.

Introduction

The unprecedented growth of information and communication technologies (ICT) driven by microelectronics, computer hardware and software systems has influenced all facets of computing applications across organizations. Simultaneously the business environment is becoming increasingly complex with functional units requiring more and more inter-functional data flow for decision making, timely and efficient procurement of product parts, management of inventory, accounting, human resources and distribution of goods and services. In this context, management of organizations needs efficient information systems to improve competitiveness by cost reduction and better logistics. It is universally recognized by large and small-to medium-size enterprises (SME) that the capability of providing the right information at the right time brings tremendous rewards to organizations in global competitive world of complex business practices. Starting in the late 1980s and the beginning of the 1990s new software systems known in the industry as enterprise resource planning (ERP) systems have surfaced in the market targeting mainly large complex business organizations. These complex, expensive, powerful, proprietary systems are off the-shelf solutions requiring consultants to tailor and implement them based on the company's requirements. In many cases they force companies to reengineer their business processes to accommodate the logic of the software modules for streamlining data flow throughout the organization. These software solutions, unlike the old, traditional in-house-designed company specific systems, are integrated multi-module commercial packages suitable for tailoring and adding "add-ons" as and when required. The phenomenal growth of computing power and the Internet is bringing ever more challenges for the ERP vendors and the customers to redesign ERP products, breaking the barrier of proprietorship and customization, and embracing the collaborative business over the intranet, extranet and the Internet in a seamless manner. The vendors already promise many "add-on" modules, some of which are already in the market as a sign of acceptance of these challenges by the ERP vendors. It is a never-ending process of reengineering and development bringing new products and solutions to the ERP market. ERP vendors and customers have recognized the need for packages that follow open architecture, provide interchangeable modules and allow easy customization and user interfacing.

ERP Systems Defined

Enterprise resource planning systems or enterprise systems are software systems for business management, encompassing modules supporting functional areas such as planning, manufacturing, sales, marketing, distribution, accounting, financial, human resource management, project management, inventory management, service and maintenance, transportation and e-business. The architecture of the software facilitates transparent integration of modules, providing flow of information between all functions within the enterprising a consistently visible manner. Corporate computing with ERPs allows companies to implement a single integrated system by replacing or re-engineering their mostly incompatible legacy information systems. American Production and Inventory Control Society (2001) has defined ERP systems as "a method for the effective planning and controlling of all the resources needed to take, make, ship and account for customer orders in a manufacturing, distribution or service company." We quote several definitions from the published literature to further explain the concept: "ERP (enterprise resource planning systems) comprises of a commercial software package that promises the seamless integration of all the information flowing through the company–financial, accounting, human resources, supply chain and customer information" (Davenport, 1998). "ERP systems are configurable information systems packages that integrate information and information-based processes within and across functional areas in an organization"

(Kumar & Van Hills gersberg, 2000). “One database, one application and a unified interface across the entire enterprise” (Tadjer, 1998). “ERP systems are computer-based systems designed to process an organization’s transactions and facilitate integrated and real-time planning, production, and customer response” (O’Leary, 2001). The concept of the ERP system can be illustrated, following Davenport (1998), with the diagram in Figure 1.

Evolution Of ERP Systems

The evolution of ERP systems closely followed the spectacular developments in the field of computer hardware and software systems. During the1960s most organizations designed, developed and implemented centralized computing systems, mostly automating their inventory control systems using inventory control packages (IC). These were legacy systems based on programming languages such as COBOL, ALGOL and FORTRAN. Material requirements planning (MRP) systems were developed in the 1970s which involved mainly planning the product or parts requirements according to the master production schedule. Following this route new software systems called manufacturing resources planning (MRP II) were introduced in the1980s with an emphasis on optimizing manufacturing processes by synchronizing the materials with production requirements. MRP II included areas such as shop floor and distribution management, project management, finance, human resource and engineering. ERP systems first appeared in the late 1980s and the beginning of the 1990s with the power of enterprise-wide inter-functional coordination and integration. Based on the technological foundations of MRP and MRP II, ERP systems integrate business processes including manufacturing, distribution, accounting, financial, human resource management, project management, inventory management, service and maintenance, and transportation, providing accessibility, visibility and consistency across the enterprise. During the 1990s ERP vendors added more modules and functions as” add-ones” to the core modules giving birth to the “extended ERPs.” These ERP extensions include advanced planning and scheduling (APS), e-business solutions such as customer relationship management (CRM) and supply chain management (SCM). Figure 2 summarizes the historical events related with ERP.

ERP Systems And Organizations

It is generally a misleading perception that implementing an ERP system will improve organizations’ functionalities overnight. The high expectation of achieving all-round cost savings and service improvements is very much dependent on how good the chosen ERP system fits to the organizational functionalities and how well the tailoring and configuration process of the system matched with the business culture, strategy and structure of the organization. Overall an ERP system is expected to improve both backbone and front-end functions simultaneously. Organizations choose and deploy ERP systems for many tangible and intangible benefits and strategic reasons. In many cases the calculation of return on investment (ROI) is weighted against the many intangible and strategic benefits. The benefits that an industry standard ERP system may bring to organizations are shown in Table 1.To reap the benefits of ERP systems, however, organizations need to overcome certain problems and disadvantages, which are listed in Table 2.

It was estimated that the spending on ERP systems in 1998 was aboutUS$17 billion following annual growth rates ranging from 30% to 50%.Companies also spend a multiple of licensing costs on services related to implementation and maintenance of the software. The worldwide license and maintenance

revenue for ERP systems was US$21.5 billion in 2000, which represented a growth of 13.1% from the 1999 market value of $US19 billion(Broatch, 2001). The continued growth of the ERP systems market is attributed to the fact that the vendors are adding applications such as supply chain management, customer relationship management and the integration of Internet-enabled applications for e-business. More than 60% of the Fortune 1000 companies have installed or are in the process of implementing packaged ERP systems to support their back-end business activities (Kraft, 2001). These packages implemented by the Fortune 1000 companies run well over the IT budgets for most SMEs. ERP vendors are targeting this untapped SME market with supposedly scaled-back systems suitable for smaller firms by offering simple, cheaper and pre-configured easy-to-install solutions within budget and time constraints. For some vendors this may lead to offering centrally managed Internet-enabled ERP-system-based services for SMEs to accessed use anytime from anywhere.
An ERP system is required to have the following characteristics:

- Modular design comprising many distinct business modules such as
- financial, manufacturing, accounting, distribution, etc.
- Use centralized common database management system (DBMS)
- The modules are integrated and provide seamless data flow among the modules, increasing operational transparency through standard interfaces
- They are generally complex systems involving high cost
- They are flexible and offer best business practices
- They require time-consuming tailoring and configuration setups for integrating with the company's business functions
- The modules work in real time with online and batch processing capabilities
- They are or soon they will be Internet-enabled
- Different ERP vendors provide ERP systems with some degree of specialty but the core modules are almost the same for all of them. Some of the core ERP modules found in the successful ERP systems are the following:
- Accounting management
- Financial management
- Manufacturing management
- Production management
- Transportation management
- Sales & distribution management
- Human resources management
- Supply chain management
- Customer relationship management
- E-Business

The modules of an ERP system can either work as stand-alone units or several modules can be combined together to form an integrated system. The systems are usually designed to operate under several operating platforms such as UNIX, MS Windows NT, Windows 2000, IBM AIX, and HP-UNIX Systems. SAP AG, the largest ERP vendor, provides a number of modules with its famous R/3 ERP system, which are shown in Table 3. New modules are introduced by SAP and other vendors in response to the market and technological demand such as the Internet technology.8 Rashid, Hossain & Patrick Enterprise systems employ thin client/server (C/S) technology or client/fat server (C/FS) architecture, creating a decentralized computing environment. In a C/S system a number of client devices operated

by end users such as desktop PCs request services from application servers, which in turn get the requested service-related information from the database servers. The requests may be simple data files, data values, communication services, transaction processing or master file updates. The general practice is to have three-tier architecture such as in Figure 3. In this three-tier system the user interface runson the client. To run ERP systems relatively powerful PCs (clients) and powerful servers are required where most of the hundreds of thousands of operations are performed. The client/server system functions are performed following three layers of logic:

- **Presentation Layer:** Graphical user interface (GUI) or browser for data entry or accessing system functions
- **Application Layer:** Business rules, functions, logic, and programs acting on data received/transferred from/to the database servers
- **Database Layer:** Management of the organization's operational or transactional data including metadata; mostly employs industry standard RDBMS with structured query language (SQL) provisions This logical arrangement helps the ERP user interface to run on the clients, the processing modules to run on the middle-tier application servers, and the database system to run on the database servers.

Summary And The Future

The major industrial information systems manufacturers that emerged from the 1980s and early 1990s defined the history of the development of ERP systems. Hence the major providers are representatives of certain industries
as much as competitors in a common marketplace. To this extent there are still opportunities for new ERP vendors to emerge from industries that so far have-not contributed to the ERP phenomenon. Some obvious examples are the
aerospace industry, the finance industry and the logistics industry. Analysis of the market penetration of ERP systems shows clearly that the current players have to downsize their products and offerings to be attractive to SMEs. There appears to be no public discussion as to how this will be achieved and whether it requires a significant change in software architecture. This situation again is an opportunity for smaller players to seize the day and offer smaller systems running on smaller hardware platforms more efficiently. These innovators will ultimately take the lead in the ERP software market as large systems will not produce the continual income stream that small, robust, easy-to-use systems can achieve. Importantly these attributes contribute to a system becoming ubiquitous in the same way that Microsoft has achieved ubiquity for its operating system.

SELECTING THE SOFTWARE

Software Name	Website
ACS Optima	www.cgsinc..com/softwaresoultions/index.html
Bann	www.bann.com
BPCS	www.ssagt.com
Datatex	www.datatex-tim.com
Intenia MovexFashion	www.intenia.com/w2000.nsf/index
JD Edwards	www.jdedwards.com
Pointman	www.pivotpoint.co.uk
SAP	www.sap.com
StyleFashion	NA
Abas	NA

1. Datatex Software

Datatex has been designing, developing, and implementing solutions exclusively for the textile and apparel industry since 1987. Dedication is the key to the Datatex development strategy. Specialization is the foundation of service to its customers. **Datatex** technological know-how and application skills have resulted in the worldwide success of **TIM Textile Integrated Manufacturing** - an ERP (Enterprise Resource Planning) solution designed for textile manufacturers of all sizes, whether vertically integrated, or specializing in just one stage of the manufacturing chain.

Datatex is an international company with offices in Italy, Israel, the USA, Germany, and

Switzerland. The **Datatex** structure has been designed to cater to:

- The customers needs
- The customers practices and procedures
- The customers competencies.

Datatex:

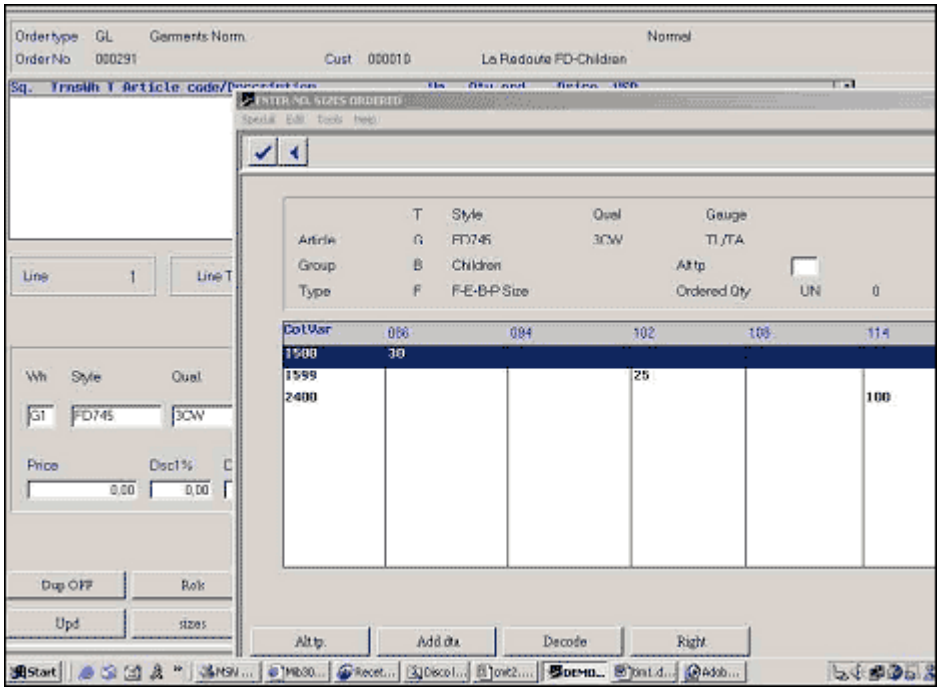
- Has the expertise required presenting a detailed and realistic offering to the textile and appareling industry.
- Has the product and skills to implement the required functions of our solution while **respecting the cost and time budgets** (On time and within budget).
- **Guarantee its customers** that **TIM** will be supported for years to come.

Figure 1.2 TIM - Textile Integrated Manufacturing

TIM is an **integrated** solution; therefore the enterprise **information is available to everyone, not just to the few**. Data is entered once and to be used across all company functions. A **TIM** implementation can cover all the manufacturing and logistical requirements, or only some of them. The **TIM** functions will be highlighted with reference to the following application areas: **Sales**, **Planning**, **Inventory** and **Purchasing**, **Manufacturing**, **Costing** and company **Database.**

MTO / Make-To-Order Highlights

- Capacity and/or materials feasibility checking
- Multi-level product views
- Suggested dates or availability if original request is not feasible
- The ability to consider forecasted orders from the master Gantt chart without having to create firm production orders
- Manual overrides of blocking as required
- Scheduling and allocating of scarce (critical) resources.



Fabric Inspection and Cut Optimization System

CATS (**Computer Aided Textile Supervision**) is a PC based module that integrates the production and inventory systems with greige and finished inspection. It provides methods to identify, map, and place inspected fabric defects either directly into the TIM database, or into an integrated PC network, so as to both archive the data, and to make it immediately available for use in allocation and production confirmation. **CATS** utilize an encoder to measure the cloth and a PC screen at each inspection table.

CATS is capable of:

- Providing a graphical user interface for inspection and cutting operators workstations, including connection to length counter
- Previous inspection performed for this roll or piece is simultaneously displayed on a graphical bar, just below the graphic bar of the actual inspection
- Coding defects, including length defects, keeping both length and width co-ordinates and denoting severity
- Ranking defects through user-defined parameters, including a points system
- Automatic calculation of quality level based on defect count or points. The quality level is constantly displayed on the graphic bar in real-time, changing color as one level is changed to another
- Producing reports of defect types, quantities downgraded per shift, per loom, etc.
- Multiple evaluation methods with different value grids
- Optimizing roll cutting
- Creating piece labels and tags
- Automatic uploading of inspected rolls/pieces into inventory
- Initializing re-inspection activities
- Interfacing with electronic weight checking systems
- Management of narrow width splitting after inspection
- Optimization of the joining of small rolls within a batch

8.6 COST OF ERP IMPLEMENTATION

Companies have to clearly know what enterprise resource is planning before thinking of implementing them. The catch word of ERP implementation is speed.

The faster it is implemented the quicker and better are the advantages and delivery in terms of results. This early process has another hold. The returns are sought at a shorter period. This deviation from the conventional practice has become the order of the day as far as many companies are concerned. Formerly Business process reengineering played a vital role with respect to implementation. It is important to know the components of Enterprise resource planning .Merely defining enterprise resource planning will not help in this. This naturally paved way to development of gaps between the actual results and the one derived during the process of foreseeing. Tuning ERP as per the whims and fancies of the practices followed in the company became a routine affair. This led to slogging and dragging beyond the time limits permitted. It was monetarily pinching and played havoc in the customer's trust. It is also necessary to understand that mere ERP planning does not guarantee the benefit of erp. It has to be implemented as planned after understanding the components of enterprise resource planning. In spite of having improved the implementation issues what remains static and unfettered is the manner in which companies go ahead with ERP implementation. They do it for the heck of it and without following systematic procedures. Infact they don't even check the desirability of going into ERP. Some issues that an organization has to address after defining enterprise resource planning are

- Popular information systems
- Likelihood of fluctuations in the choice of technology
- The ability of market players to stay in tune with it
- The ways and means to implement a business applications like ERP
- To benefit from the same so as to gain a competitive edge
- Their usage and services
- The necessity for innovating software applications

If an organization is able to answer these questions without any ambiguity and substantiate the results then it can be said that it has a path or up focus in taking ERP. The questions mentioned above are crucial and will even decide the business model of the company. ERP implementation is a vital in the whole process of ERP. They can take place only if one understands "What is enterprise resource Planning" and defining enterprise resource planning in their organization.

Current Approach

It is essential to have an overview of the current approach. The current approach is claimed to be relatively successful.
The current approach more popularly referred to as "baan" has two underlying principles

The idea which concentrates on molding the business

This category is prominent when the organizational unit calls for a radical restructing process by all means. This process will be carried in all aspects of the business .Some of them include strategic manouvere, operation of trade and the circumstances that call for change and adaptability. Defining enterprise resource planning in context to the concerned organization will help to decide on this issue.

The plan which lays more emphasis on technical parameters.

Here business takes the back seat. The thrust lies on technical dimensions. This does not ignore the commercial viability as such but they occupy seat only in the due course of time more so when operations are triggered in full stream and not at the initial stage itself. The advantage with this type is that it does not call for an immediate modification of the business structure. However it is essential to know the components of enterprise resource planning.

Conclusion

The popularity of ERP as a business application does deserve a special mention. The most crucial factor in the whole system of ERP is the implementation aspect. The implementation phase has the ability to cast the spell on ERP'S fortune. As discussed before the success of an ERP Implementation lies in quicker processes and hence training and the speed at which the quintessence of training is received decides its worth and value. Above all one has to clearly understand "What is Enterprise resource Planning"? and then implement it.

Other Issues.

Structure

9.1 Organizational Structures

9.2 Communication Skills

9.3 Raw Material Purchases

9.4 Recruiting and Training

9.1 ORGANIZATIONAL STRUCTURE

Organizational structure depends on the product to be developed. Wheelwright and Clark define a continuum of organizational structures between two extremes, functional organizations and project organizations. Functional organizations are organized according to technological disciplines. Senior functional managers are responsible for allocating resources. The responsibility for the total product is not allocated to a single person. Coordination occurs through rules and procedures, detailed specifications, shared traditions among engineers and meetings (ad hoc and structured). Products that need a high level of specialized knowledge require a functionally organized structure.

A light-weighted matrix organization remains functional and the level of specialization is comparable to that found in the functional mode. What is different, is the addition of a product manager who coordinates the product creation activities through liaison representatives from each function. Their main tasks are: to collect information, to solve conflicts and to facilitate achievement of overall project objectives. Their status and influence are less as compared to functional managers, because they have no direct access to working-level people.

A heavy-weighted matrix organization exists of a matrix with dominant the project structure and underlying the functional departments. The product manager has a broader responsibility. Manufacturing, marketing and concept development are included. The status and influence of the product manager, who is usually a senior, is the same or higher as compared to the functional manager. compared to functional managers, because they have no direct access to working-level people.

A project organization exists of product oriented flows: project and teams. The project members leave their functional department and devote all their time to the project. They share the same location. The professionals are less specialized and have broader tasks, skills and responsibilities. The functional manager is responsible for the personnel development and the more detailed technology research in the functional groups.

Companies can be classified to their organizational structures. Another variable companies can be classified to is the nature of the projects undertaken. We characterize projects by the number of

employees needed to perform the tasks, or workload, and the number of tasks that are fundamentally different in nature. An example of the latter aspect is PCB development and structural design.

Another way to classify organization structure is by one of the following four categories:

I. The product to be developed is comprehensible for one person. One person is likely to have all the knowledge needed to develop Manufacturing and Assembly. The development department in companies that undertake these kinds of projects are usually very small. If a company consists of more than one department, it is usually structured as a functional organization.

II. The product to be developed has a fairly low complexity, but total work is high. These kind of products are likely to be developed within one functional department. A research department may also be an example of a department in which type II projects are undertaken. Are more departments involved, then the light weighted matrix structure is preferable. Employees are involved on a full-time basis. Tasks may be performed concurrently. The sequence can be determined using the Design Structure Matrix.

III. The product to be developed consists of a lot of different elements, such as software, PCB, power supply and mechanical structure. The product is however in the engineering phase, i.e. it is clear what needs to be done to get the product into production. Various disciplines perform their own tasks. These tasks have mostly a low workload. Employees cannot work full-time on one project. This creates a complex situation, that may be compared to a job shop situation in production logistics. Though the comparison between manufacturing and product development is not accepted by all product development managers, it may yield good results. Studying each step in the Product Development Process and fluctuations in workloads reveals ways to reduce variation and eliminate bottlenecks. It is necessary to view the Product Development Process as a process and not as a list of projects. Three important findings regarding this are:

Projects get done faster if the organization takes on fewer at a time.

Investments to relieve bottlenecks yield disproportionately large time-to-market benefits.

Eliminating unnecessary variation in workloads and work processes eliminates distractions and delays, thereby freeing up the organization to focus on the creative parts of the task.

Creating cross-functional concurrent engineering teams is the right way to develop products. However, the pitfall is too many project at the same time, so that key people from engineering, marketing and manufacturing work at five or more projects at once. This results in congestion. Striving to work at 100% of the product development capacity lengthens product development lead times enormously. A more realistic percentage is 80%. Attention must be focused on bottlenecks, these days most commonly found at the software development side of the project.

IV. The product is complex. Total work is high. Employees can thus participate on a full-time basis. A project organization is the most appropriate organizational structure for these kind's of products.

9.2 COMMUNICATION SKILLS

The ability to communicate is the primary factor that distinguishes human beings from animals. And it is the ability to communicate well that distinguishes one individual from another.

The fact, is that apart from the basic necessities, one needs to be equipped with habits for good communication skills, as this is what will make them a happy and successful social being. In order to develop these habits, one needs to first acknowledge the fact that they need to improve communication skills from time to time. They need to take stock of the way they interact and the direction in which their work and personal relations are going. The only constant in life is change, and the more one accepts one's strengths and works towards dealing with their shortcomings, especially in the area of communication skills, the better will be their interactions and the more their social popularity. The dominating question that comes here is: How to improve communication skills? Well, the answer is simple. One can find plenty of literature on this. There are also experts, who conduct workshops and seminars based on communication skills of men and women. In fact, a large number of companies are bringing in trainers to regularly conduct sessions on the subject, in order to help their work force maintain better interpersonal work relations. Today, effective communication skills has become a predominant factor even while recruiting employees. While interviewing candidates, most interviewers judge them on the basis of the way they communicate. They believe that skills can be improvised on the job; but ability to communicate well is important, as every employee becomes the representing face of the company.

There are trainers, who specialize in delivering custom-made programs on the subject. Through the session they not only facilitate better skills in the department of communications, but also look into the problems that come in the way of being able to convey messages effectively. They discuss these issues with the management and then sought to design programs accordingly. For instance, time mismanagement becomes a cause for stress and frustration, which then hampers the possibility of healthy communications at work. Then in weeks to come the company organizes a program on time management. Thus, a workshop on communication skills helps the management t to deal with the finer employee nuances about which they lack awareness.

9.3 RAW MATERIALS PURCHASE

Once the firm has decided on the foremost issues of which product it wants to produce and the location of the industry, the next important step is to select appropriate technology and equipment to produce the same. In addition to this, the source of raw material has to be decided upon. The requirements of all these can either be met through domestic sources or can be imported subject to the regulatory requirements of the Government. The regulatory requirements pertaining to the import procedures vary depending on the item of import. In case of raw materials, the Export Import Policy of the Government regulates imports. However, in the case of technology, the Foreign Direct Investment (FDI) Policy and the Foreign Technology Transfer Agreements govern the imports. The firm should do a careful cost and benefit analysis before going ahead with the process of placing the orders to minimize the production costs and hence increasing the profit margins. Various sources of Capital should be explored and the cost of capital should be analyzed cautiously.

Process Selection

Once the choice of the product is made, selection of the right process technology becomes important. The process technology required may be :-

Indigenously developed:- In India, technologies are being developed at CSIR and Defense Research Labs. There are some intermediaries like APCTT (Asian and Pacific Centre for Transfer of Technology), TBSE(Technology Bureau for Small Enterprises) which can help you to locate the relevant technologies. Besides there are some In-house R & D centers of companies which develop technologies and sell them to interested parties. Indigenously developed process know-how has intrinsic benefits like appropriateness, relative inexpensiveness and possibility to work with technology developer.

Imported :- For some complex products, process know-how has to be imported. In such cases agreements for technology transfer should be made with due care in order to safeguard nation's interest. Government of India facilitates foreign technology induction both through FDI and through foreign technology collaboration agreements. FDI and Foreign technology collaboration agreements can be approved either through the automatic route under the powers delegated to the Reserve Bank of India or otherwise by the Government.

For more details visit our Section on **"Doing Business Abroad"**

While choosing the process technology, the following considerations are essential :-

The level of skilled workers or complex machines required by the process.
The quantity of water and / or power required.
If any process or product patent is needed in order to utilize the selected process technology.
Any special Pollution or Environmental regulation is to be followed.
The appropriateness of the technology to the Indian environment and conditions.

Raw Materials

Raw Material procurement and planning are critical to success, of a start-up unit. The raw materials required may be:-

Domestically available (within the country):- As we know that our country is a resource rich country with abundance of specific raw materials in different States. (For details, please refer to 'Investment opportunities and incentives' section). Accordingly appropriate suppliers of raw materials have to be selected.

Imported from abroad:- For importing the raw materials the Government rules and regulations have to be followed. The imports are regulated by the **Foreign Trade (Development and Regulation) Act, 1992**. The Act provides for the appointment by the Central Government, of a **Director General of Foreign Trade** for the purpose of the Act. The DGFT shall advise Central Government in formulating export and import policy and implementing the policy. (For details, please refer to 'Legal Aspects' section).

Whatever be the source of raw materials it must be bought from reputed dealers and agencies only. Before ordering, compare the prices and get quotation from at least 3-4 places and also check whether price is inclusive or exclusive of transportation costs. While receiving the delivery, check the quality and quantity of the materials.

Proper planning is essential because non-availability of the required raw material may result in production hold-ups, idle machinery and manpower. On the other hand if too much is ordered too soon considerable amount of working capital gets locked up. All this will lead to increased production costs. But proper inventory management can lead to manageable cash flow situations. For imported raw material whose lead time are large, proper planning is all the more essential.

Machinery and Equipments

The next important step is choosing and ordering of right machinery and equipments. The machinery and equipments required may be either domestically available or imported from abroad. For importing machinery and equipments, the Government rules and regulations have to be followed. The imports are regulated by the **Foreign Trade (Development and Regulation) Act, 1992**. The Act provides for the appointment by the Central Government, of a **Director General of Foreign Trade** for the purpose of the Act. The DGFT shall advise Central Government in formulating export and import policy and implementing the policy. (For details, refer to 'Legal Aspects' section). Generally, technology or process provides with the necessary specifications relating to machinery and equipment required. Otherwise, an extensive techno-economic survey of the available machinery and equipment may be carried out. International trade fairs and engineering fairs are good places to look at available options. The entrepreneur may also consult experts, dealers / suppliers as well as users, prior to making a selection of equipment and machinery. Many entrepreneurs buy second hand machines and equipments. But this leads to the problem of prevalence of outdated production and management methods hindering the efficient operation of business units. The advice of SISI and NSIC can also be sought. There are 30 **SISIs (Small Industries Services Institutes)** set up in State capitals and other industrial cities all over the country. The main objective of **National Small Industries Corporation (NSIC)** is to provide machinery and equipment to small industrial units offering them long repayment period with moderate rate of interest. It has been found that small industrialists are unable to install modern machinery and equipment due to lack of investable funds. Hence many schemes and incentives are available to assist them. Now, small scale firms can acquire industrial machinery, office equipment, vehicles, etc, without making full payment through hire purchase. With the help of assets acquired through hire purchase, they can produce and sell. From the earning of production , they can make payments in installment. Ultimately the ownership of assets can be acquired. National Small Industries Corporation (NSIC) provides machinery and equipment to small scale units on hire purchase basis and on lease basis. NSIC follows the following Hire Purchase procedure and Hire Purchase Scheme for financing plant and machinery to small scale units: The hire purchase application is to be made on the prescribed form. The Director of Industries of the State under whose jurisdiction the applicant falls, forwards the application to the head office of the NSIC at Delhi with his recommendation and comments. All applications for indigenous or imported machines are considered by acceptance committees comprising of the representatives of the Chief Controller of Imports, Development Commissioner, Small Scale Industries and other concerned departments. Decisions of these committees are conveyed to the parties concerned with copies to the regional offices of the NSIC and the concerned Directorate of Industries. It is open to an applicant whose case has been rejected to get his application reviewed by a high powered committee. Once the hirer completes all these formalities, instructions are sent to the suppliers to dispatch the consignment (duly insured for transit risk) to the hirer and to send the R/R or C/R as the case may be, to the regional office. The NSIC after ensuring that the hirer has paid all dues, releases the R/R or C/R to him for taking delivery of the machines. In case of imported machines, the procedure is slightly different in as much as the shipping documents

are sent to the clearing agents for clearing the consignment from the Customs and dispatching it to the hirer

Why People Volunteer

We must understand people's goals and interests and what motivates them to volunteer for additional roles. Many of those factors include the following.

They desire fun and fellowship.

They want to feel like they are Belonging to a team.

They wish to develop and improve their personal skills.

They look forward to making new friends and associating with people not normally found in their career or community life.

They seek recognition and fulfillment that they do not get through their career.
They believe in Scouting's values and principles.
They want to help other people.
They want to get away from the drudgery of their work, and do something different and FUN—something they would like to do but do not feel they could earn a living doing.

Why Volunteers Stay

They appreciate Scouting's role in their child's education.
They were given proper orientation.
They had adequate training.
They enjoy the opportunity to expand their horizons.
They enjoy fellowship with other Scouters.
They enjoy recognition for their service.
They have FUN.

Why Volunteers Leave

They had no orientation for their position.
There was a lack of training.
They were not given specific assignments.
They were not given sufficient responsibility.
There was poor communication with the chairperson.
There was a lack of recognition.
There was a lack of personal satisfaction.
Personal time commitments interfered.

9.4 RECRUITING AND TRAINING

Often when we need to recruit a new staff member, we use one of two methods.

The first method is pulling recruits from an existing trainer list. The second method is thinking of everyone that we know who we think would fit the bill. By recruiting new staff this way, we either run out of people to recruit or we start asking the same people over and over again to fill our needs.

The problem with these methods is that we either do not fill our staff needs or we recruit people who might not be the ideal match to the position.

The process that follows, outlines an effective process of finding the right person to fill your staff needs.

Before You Begin: Develop a List of Needs

Before you can recruit new staff, it is important to know what you need. Recruits will want to know their responsibilities and your expectations for them. Having the answers to those questions at hand also will help you naturally avoid a common problem. For example, a group of trainers who are given no specific tasks will do exactly what they are asked to do—nothing.

Ask participants: What are some positions that you need to fill for your district, council, or event?

List the answers on the flip chart. Possible answers include:

District trainers
Event chairs
Council trainers
Council training events
Certified trainers
Train the trainer courses
Event trainers
Skill instructors
Session leaders

Distribute the Prospect Work Sheet and have participants fill in as much information as possible, listing a specific position description and a list of skills that an ideal prospect would possess.

When participants have had time to work on their work sheets, share several of them with the entire group. Then tell participants: Once you have defined the position you're looking for, you can begin the recruiting process.

Step 1: Identifying Your Staffing Needs

Critical to the success of your training program is the selection of quality staff who represent the values of the Boy Scouts of America. The selection process begins with identifying the number of people needed and any specific talents they should have.

Important in staffing is planning for your succession. Consider prospects for key positions a year or two in advance. Who might have the skills? Cultivate them in advance. Create a position of responsibility for the person you are cultivating. Build good rapport with that person.

Prepare a position description for your training staff. This will help both in identifying prospects and in the actual recruiting process. Don't use a "canned" description—make it specific to your current needs.

Your district executive or council staff can provide many support materials and can share recruiting techniques and other information that will be vital to your search for a quality training staff.

Step 2: Develop a List of Prospects

Develop a list of prospects that closely fit the training needs for your event or training staff needs. Here are some tips:

Consider current Scouters, Scouting families, former Scouters, Wood Badge bead recipients, and recommendations from other Scouters.

Brainstorm by yourself and with others to identify potential candidates.

Be sure potential candidates demonstrate the values of the Scout Oath and Law in their daily lives.

Prioritize prospects for specific needs.

Consider forming a "nominating committee" to identify and help in recruiting prospects. The result can be a broader range of candidates, "buy in" by training stakeholders, and likely some of your new trainers will be nominating committee members.

When recruiting staff for a repetitive function or training remember it is important to continuously bring in new people so as to:

Avoid burning out the "regular" helpers.

Have additional trained people available to fill in if the "regulars" are unavailable.

Build up a base of available trainers to ease the burden of staffing an event.

Try to have a diverse staff that reflects age, ethnic, geographic area, and gender so as to offer the participants a comfortable enough feeling to address their issues and answer personal questions.

Step 3: Contact Your Prospects

Talk with your prospect about the position, including:

The job description

How their skills, talents, and personality fit with your staff or event needs

Any time requirements, dates, and any other important information they may need for the position

Ideally, you will identify the right person to ask the prospect—the person with the best connection to the prospect. If you can't find a "right person," do the best you can. It might work best to have two or three people making the contact, but remember to not overwhelm the candidate with a large group of people.

Make the contact face-to-face if possible and convenient for the prospect.

Role Play: Contacting the Prospect

Instructor Note: Divide participants into groups and role-play the first scenario of contacting the prospect. You will need a minimum of participants: the training chair, the prospect, and an acquaintance of the prospect.

When participants have had a few minutes to practice the role-play, lead the reflection time by asking:

How did you feel about asking for help?
How about when you were being asked to help?
Was this exercise helpful? If so, how?

Have the same participant groups role-play the second scenario, and repeat the reflection questions.

Hopefully, your contact with the prospect will be successful. If the prospect does agree to serve as a leader, the next step is to seal the deal.

Step 4: Ask for Commitment

Welcome the prospect to your training staff or event.

Thank him or her for volunteering.
Explain the schedule and calendar.

If the prospect is hesitant, be ready with further information and resources. Give the prospect a reasonable, short period of time to decide (two or three days).

If the prospect declines, thank him or her anyway. Consider asking the prospect to consider a different position (be sure to have a specific one in mind).

Step 5: Schedule Training

Schedule training as necessary.

Depending on the prospect's individuals talents, experience, and training status, determine what training may be necessary and schedule as appropriate

The BSA wants each member of the training staff to succeed in his or her new role. If we fail to explain the expectations we have for the new training staff member we fail to communicate the tools to do what is expected, then the odds of the new training staff member succeeding and being comfortable in the new position are greatly reduced.

Summary

Recruiting new staff is a continuous process. We always need to be on the lookout for opportunities to expand our training staff, but we need to do so by recruiting the right person for the right position. We need to be aware that if we find the right person, he or she might not be available at that time. Always keep your prospect list ongoing.

By following the five steps to recruiting quality training staff, we can avoid recruiting people just to have them around with no specific purpose. If we do not give them a responsibility, then we risk that they will do nothing for us since we have never asked them to do anything. And ALWAYS take YES for an answer

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Rai Technology University

ENGINEERING MINDS

Rai Technology University Campus

Dhodballapur Nelmangala Road, SH -74, Off Highway 207, Dhodballapur Taluk, Bangalore - 561204

E-mail: info@raitechuniversity.in | Web: www.raitechuniversity.in